

Canadian Computer **Wholesaler**

THE RESELLER'S RESOURCE

February 1990 Vol. 2 No. 1



Who is really doing **Client/Server Computing?**

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- Surfing the Net on Java with HotJava
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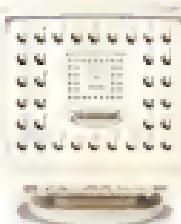
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CONTENTS

Cover story

Client/Server Computing - who's doing it?

The hype on client/server computing is mainly that The market for them was vastly over estimated and didn't take into account the retained value of existing installed infrastructures and databases of large computing users. Consumers of client/server computing will mainly be the small to medium sized enterprises looking to improve their computing performance.

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Surfing the Net on Java with HotJava

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Imaging

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Reviews

What's new on CD-RDM players?

Review of NEC's Hub Spin and CD-RW

departments

Industry Flash

12

People

12

New Products

12

Q & A

12

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12

12

12

12

12

12

12

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- PC Magazine Sept. 26, 1995

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CCAB membership applied for in July 95

STD and Motorola build Canada's first PowerPC systems

STD Systems has started shipping the first Canadian manufactured RISC-based PowerPC systems. STD will be marketing this new line of workstations and servers known as the Power2 series, to universities, government research facilities and industrial communities across Canada. The Power2 product family is the latest addition to STD's ComputerPartner line of computer systems operating on the Microsoft Windows NT 3.51 system platform. The Atlas motherboard is supplied by Motorola Computer Group running PowerPC 603, 603 and 604 microprocessors.

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COMDEX/Pacrim set attendee record

Over 30,000 people attended the 3-day COMDEX/Pacrim '96 trade show from Jan 16-18, 1996 at the Vancouver Trade and Convention Centre making it the largest information technology event in the Pacific Northwest. In its second year, the COMDEX/Pacrim show grew more than 25% over the '95 event. It attracted over 13 BC based companies, as well as 62 US and 113 companies from Ontario and other Canadian provinces.

More than 230 exhibiting companies filled the floor with new products and services. Companies included IBM Canada, Apple Canada, Compaq Canada, Digital Equipment of Canada, IBM Canada, Macintosh Canada, Matsushita, Novell Canada, Xerox Canada, Integral Direct and Canadian Computer Wholesaler magazine.

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INDUSTRY FLASH

EMI picks up Data General AVION servers

Data General Canada and EMI Data Systems Ltd., have signed a national distribution agreement. EMI will distribute Data General's new line of Intel based AVION servers.

The servers range from single processor units up to 8 processors and can run over 15,000 UNIX applications from such vendors like Computer Associates, Informix, Oracle, Peoplesoft, Pek Systems, Progress, Sybase, Tivoli, Unidata and Veritas, as well as the approximately 1,000 Windows NT based programs.

Digital's Super Spider takes 2 million hits on Web

One week after its introduction, Digital Equipment of Canada's advanced "super spider" technology, code-named Altis Vista, has become the fastest-growing information search and indexing device on the Internet's World Wide Web with over 2 million users daily. It is up to 100 times faster than other spiders.

Digital's super spider technology surpasses the limitations of current information services by delivering the most complete, precise, and up-to-date information of the Web's nature and to conduct the most comprehensive search of the entire Web orders of magnitude faster than spiders used in conventional information search services. The super spider creates and dispatches a "flock of spiders" that crawl the entire Web. Second-generation searchable software simultaneously locates and indexes text as it finds Web pages. A powerful search engine enables Web users to conduct precise searches for specific information by looking for phrases, specifying key words, using case-sensitive matching, and conducting searches in titles or other parts of a document.

The super spider has crawled the Web at up to 2.5 million pages per day, finding and indexing more information than any other spider or crawling service. It is an easy to find every page and indexing every word of text on the Web.

You can try Altis Vista at <http://info.digital.ca>

Ingram puts computers in Classrooms

In an initiative called Future Frontiers, Ingram Micro will allocate one dollar from the sale of each computer into a funding pool reserved for the purchase of computers to be awarded to schools across the country.

The systems will be apportioned by the percentage of CPU business Ingram Micro conducts in each province, so retailers can be assured that their purchase will directly benefit their local community. In addition, the program will focus on targeting schools in the need and lower income communities where computing based funding is not readily available. Ten percent of the systems will be awarded to schools for physically and mentally handicapped children. Retailers will be encouraged to participate in the program by offering to support the installed technology and they will be encouraged to nominate recipient schools.

Digital Users meet at Hyatt in Vancouver

DCUS or Digital Equipment Computer Users Society is holding its 27th annual meeting at the Hyatt Regency Hotel in Vancouver from Feb. 26 to March 1, 1996. The theme of the event is Expanding the Distributed Enterprise. <http://www.dcuca.ca>

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by Edward Trojanski

Client/Server Computing

- who's doing it?

**There's a joke going around the computer industry:
client-server computing is like teenage sex.
Everybody thinks everyone else is doing it.
Fewer people are doing it than you think.
Those who are doing it aren't doing it well.
And everyone hopes it's going to get better.
Client server has become a catch-all
phrase for whatever anybody is doing.**

You can't sell a client-server奔奴斯 then you're not such thing. You can sell a client-server system that includes server hardware, client hardware, networking hardware and the software that pulls it all together. It's up to the reseller to put the client/server package together that can do the job to sell each individual item.

The definition of client server changes depending on who you are talking to and how they are packaging their particular brand of client-server. By client server technology we mean two or more machines working on an application cooperatively across a network integrating hardware and software. In some circles the basic act of file sharing is considered to be client-server computing but, technically, it is just one aspect.

For many people client-server implies a migration from mainframe computers to the desktop. There is a greater number of machines installed than one might realize, but more of

them are operating in a stand alone environment on a network with desktop computers and work stations. The ClariNet Group, an information technology market research company based in Stamford, Mass., predicts that in 1994 the world-wide market for client-server products and services would exceed \$300 billion US, didn't even come close to its September 1993 report, *The Pace of Mainframe Migration*, The Gartner Group said "...the expectations on the death of the mainframe and the stampede toward client/server systems have become tongue-tied by reality."

Rather than running their backs on these large investments in midframes many large companies are migrating these installed databases on mainframe computers and using them as servers and using Intel based desktop PC running Windows as clients. It is smaller organizations without the installed mainframe base who are moving more aggressively toward a

completely distributed computing model. The market is in the smaller to medium sized companies and that is where the real growth is.

Users point out that each platform has its strengths. Midframes are good at moving large volumes of data to many users very quickly. PCs are good at local manipulation of currency data and mid-sized machines act as intermediaries between the two by behaving as temporary warehouses for data. A client/server application can be broken down into segments and each put on the computer platform that makes the most sense. The user at the intelligent desktop with a graphical interface can talk to another part of the system, and the data can be stored in a third part of the system offering users more responsiveness, enhanced usability, greater flexibility. People with no understanding of the underlying client/server technology can use it more effectively than a traditional mainframe.

While it can cost as much as 50 percent more than traditional mainframe technology, a client-server system allows you to scale your space in small, low-expense increments. If there is another user all you have to do is buy a new PC and put it on the desk.

Computing used to be like going to Kmart to buy everything that you want... home goods, electronics and clothing," says Bill Hurni, Enterprise Marketing Manager for PC business at Digital Equipment Corporation, Canada. "Client server computing is like going

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Who's really doing Client/Server computing?

The formal underpinnings of the client-server model come out of the communications world where the idea of the client requesting something on one machine and having it happen on another machine and getting a response back originated.

(Continued from page 18)

to the shopping mall. You still have the department store that provides a number of services but you also have specialty shops like Burks, the Big and Tall Shop and Radio Shack. I can get the kind of services that I want instead of always having to go to Eaton's."

The formal underpinnings of the client-server model came out of the communications world where the idea of the client requesting something on one machine and having it happen on another machine and getting a response back originated. Since then, the push has moved from batch processing, to time sharing, to personal computing, and now to client-server computing. The emergence of high-power low-cost desktop machines driven by Intel and Microsoft made computing available to everyone. Giese Computer Corp., the Markham, Ontario-based maker of vernier library, financial and business applications and one of the first to integrate software, hardware and telecommunications engineering services, is now redeveloping its products for the client-server model.

We're doing client servers for 1800 user systems and we're doing client servers for one user systems, says Steven Eckhardt, business partners manager for Giese Canada. "From large companies like CBC and large libraries to small construction companies, we're doing client servers across the board."

The fast growth of Microsoft Windows NT and the accompanying lower cost and broad availability of software for Windows NT is also driving client-server computing. The release of Microsoft Windows NT Workstation operating system version 3.1 in June has again spurred the client server buzz, heralding the desktop as the center of the client-server computing universe. Windows NT Workstation 3.1 sells for about \$428 per license with French Mandarin Chinese (traditional and simplified), Korean, German, Dutch, Italian, Spanish, Portuguese, Brazilian, Swedish, Danish, Norwegian and English versions available as well as English. Some analysts think this single operating system, that can run all the parts of the process including the client, the server and print services, will be the impetus that will drive client-server computing into the mass market.

The great thing about Windows NT is it's a platform that combines the traditional file and print services with the traditional client-server services, says Owen Sageret, product manager for Windows NT, Microsoft Canada. "Windows NT is the best foundation for this new generation of computing, because mainframe and UNIX require a lot of expertise."

"A lot of our work is being done right now with Microsoft," says Digital's

Bill Hams. "We anticipate that 99 and 44/500 percent of all the clients in a client-server environment will be Microsoft based clients and we anticipate that a very large percent of the servers will be Microsoft based servers."

Digital has moved squarely into distributed computing, positioning itself to a wide range of Intel and Alpha servers with NT and UNIX operating systems which seems to be the direction no customers are heading. It has also added a wide range networking hardware products - including routers and bridges, as well as middleware software.

Sybise Canada doesn't think Microsoft will offer the complete solution. Dave Toombs, technical manager for Sybise Canada says his company's client server software takes the desktop to the back offices and leverages the products you already have. "If you look at Microsoft as the only solution you won't be able to integrate as tightly with legacy systems. Basically you have to throw away what you have and bring in the new in a very short period of time."

What many resellers are looking at is organizations will have to upgrade their computers to keep pace. As technology evolves, existing systems will not have the performance or hard drive storage or memory to perform and they will need more networking components and tools and software functionality to operate over faster data lines.

It allows resellers to sell a complete package including consulting, a central server, software, networking and the workstation. As it evolves, the reseller will maintain an ongoing relation because the nature of client-server computing requires more services and consulting. □

Java and HotJava: *a little background*

By Dan DeSisto

Not your average cup of Joe

Java is exciting! It's impressive! It has the potential to significantly change the way we think about and approach networked computing. It's introduction as a competitor with the Internet could very well mark the beginning of a new era in computing.

You, computing in general and the Internet in particular are widely beyond this industry's focus on it. No, this stuff isn't going to affect world peace, end all human suffering, cure blindness or even contain global warming. But that's not the point. Java is not hype. There is a powerful reality behind this new programming language and environment. Maybe you will be as impressed as I was.

The purpose of this article is to obtain a conceptual overview of Java. Those interested

in a more in-depth understanding of Java and Java related subjects should visit Sun Microsystems' Java website at <http://java.sun.com>. The Java Language: A White Paper and The Modern Browser: A White Paper are both available at this site.

A little ancient history

The core technology of Java is an outgrowth of a consumer electronics R&D project started by Sun Microsystems in April, 1991. The goal was to develop advanced software for a variety of networked devices and embedded systems (devices which are intended to send and communicate through a network). They needed a small, reliable, portable, distributed, real-time operating environment. Starting with the C++ language, they tried to extend the compiler, a critical part in making the portable and

platform-independent environment they wanted. The approach soon proved too problematic. Realizing the problems they faced could best be addressed by developing an entirely new language, they began working on what they then called Oak, which would later be renamed Java.

Java was first used in developing a prototype PDA (personal digital assistant) like device, this went nowhere due to a consistent market, which Apple's Newton later demonstrated. They then applied their Java technology to the Set-top box and video-on-demand market; this also didn't pan out for a number of reasons.

By the spring of 1994 it was obvious the Internet had come; specifically the World Wide Web was exploding in popularity with the re-

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Surfing the Net on Java with HotJava

lease of the NSCA's Mosaic, the first web browser and graphical interface to the Web. They realized the potential of Java in combination with the Internet, the mother of all heterogeneous networks. Their new mission was to supercharge web browsers. They began porting Java to the PC, Mac and Sun platforms and developing a web browser in Java. The result was HotJava. The Java Environment and HotJava were formally announced by Sun at SunWorld '95 in May, 1995.

Java

What is Java? It's a group of technologies. A programming language for developing applications, an architecture for running those applications and a set of tools to build and compile those same applications. Java incorporates a variety of features which include being portable, architected around interpreted, dynamic object-oriented, high-performance, multi-threaded, secure and robust. This allows Java to send architecturally

neutral code that is dynamically loaded and run on any heterogeneous network. If you don't quite understand what all this gibberish means, read on, I'll try to explain.

It is important to keep in mind that Java's features are determined by the nature of the computing environment in which the software must be deployed. As it stands, this means supporting applications on multiple incompatible hardware architectures, multiple incompatible operating systems and one or more incompatible graphical interfaces, all within a distributed client-server on heterogeneous network.

Java allows you to run the same application or program created with Java on any machine you choose as long as Java interpreter and run-time system have been ported to that same machine. The run-time system and interpreter can exist inside a program, such as a WWW browser like HotJava, or as a stand alone on the machine.

To understand how Java achieves this portability, you must first understand how a program written in another language handles this process. First a program is created in lets say C++. The program in its present form is called source code. For the program to become an executable, that is a program that can be run on your computer, it must be converted into machine or native code. A compiler handles this task. This all sounds simple enough, but the problems begin here. Every platform has its own compiler, and the program will only run on that platform if you use the correct compiler for that specific platform. Compilers also cause a number of other headaches for programmers, which I won't elaborate on here. With the number of different platforms out there you can see that compiling and compatibility issues would quickly add up. This also creates some real complications in a heterogeneous network where any kind of machine could be sitting at the other end of the connection.

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Java gets around this problem by having their compiler compile the source code to a machine that doesn't exist—the Java Virtual Machine. The program now takes the form of an architecture-aware intermediate format called Java bytecode. In this form the program can be sent over the network to any machine or played directly on any machine, as long as the Java interpreter and run-time system have been ported to that machine. In some the Java interpreter is invoking the Java bytecode via sharing it's running on the Java Virtual Machine. By this little trick, Java has reduced the number of applications to be ported to any platform to one, the interpreter. After this, any application programs or objects created in Java can run on any platform which has a Java interpreter and the run-time environment. Now isn't that...

Java could be used as the principle engine for interaction and behavior of objects in the next version of VRML. It could be used to provide all kinds of stored-alive applications which are retrieved over the network, used and returned. It could be used in any number of innovative ways because of its dynamically extensible and portable nature.

The portability of the system also depends on the basic data types and arithmetic operators. Java specifies basic data type sizes and arithmetic operator behavior unlike the C programming language where data takes up different sizes depending on the underlying hardware and OS. This has the effect of making the Java program hardware independent. There are a number of other smaller issues that help complete the portability of the system, but these two issues are in the heart of Java's portability.

Java is truly an object-oriented language; another critical feature for a language to thrive in a complex, network-based environment. Object-oriented is one of the most used and abused words in computing, let me define for you a very basic idea of what this paradigm means. In object-oriented computing the most fundamental entity is the object. The idea behind this is that we all live in a world of objects and we use to dealing with them in our everyday lives. Let's use as an example a hammer. A hammer has certain properties and it can be controlled in certain ways. When you use a hammer you don't worry about having to define it and tell the wood and metal atoms what to do, you just pick it up and use it as an object. In this same sense, you created and define an object in computing and after that you can keep on using it. In Java the object is referred to as the class. The class is a reusable and dynamically loadable object which encapsulates functionality in a collection of variables and methods. The class can be used as a template to create other classes with additional functionality. Java also allows the dynamic loading of classes. This means that if additional functionality is needed while using an application new classes can be loaded, on-the-fly, that encapsulate the methods needed causing a seamless interaction. As an example you are creating the WWW using a Java enabled browser you access a graphic file for which you don't have a helper application. Instead of not being able to retrieve the file, the Java browser can ask the server for a class that can display the file. It would load this class and the file immediately and bang...up comes the graphic seamlessly.

Java is a robust environment, a absolute necessity when you are automatically loading and running Java programs. Java does not use pointers but has true memory arrays. This eliminates the chance of overwriting memory (a real no-no) and corrupting data. Java also has automatic memory management in the form of a garbage collector running on a low priority thread in the background, this allows objects without

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Surfing the Net on Java with HotJava

reference to be cleared from memory when the program is not busy using processor cycles. Java is also secure.

which is closely related to robustness. The elimination of pointers makes it impossible to forge access to data structures, a common activity of viruses. Java checks the code for language compliance at both the compiler and interpreter levels, due to the possibility that code could have been altered between compile time and run time. The interpreter also continues its security checks by watching the classes loaded and making sure they only access the file system in the correct manner.

Java is also high-performance. It is a language which features such robustness, security and portability you would expect some loss of performance, certainly interpreted code can't run as fast as native code, but Java does a good job of getting around these obstacles, reducing the amount of overhead when in use. With built-in multithreading Java uses a low priority thread to do system resource management and memory management when the processor is idle. The compiled Java bytecode is also surprisingly fast at interpreting closer to machine code, since they are very similar.

HotJava

HotJava is a dynamic second-generation Web browser. It is the first major end-user application created with the Java language and runtime environment and therefore incorporates all the functionality of Java. The most important feature being its ability to dynamically add to its capabilities. It should be noted that a number of companies have licensed Java for incorporation into their products. The newest beta versions of the most popular browsers, such as Netscape Navigator 2.0, are now Java enabled.

Conventional Web browsers allow the downloading of static pages which are limited to the data types that the browser recognizes. These must be hard-wired into the browser or added as helper applications. This causes obvious problems when new protocols and data types are introduced; the browser keeps growing in size and verbiage. The interactivity is limited to point-and-click

browsing, which allows you to navigate through the data in a fairly stilted fashion, but is not interactive in the true sense.

HotJava can dynamically download Java programs or applets, from anywhere on the Internet, which are then run locally on your computer. That allows the browser to dynamically add to its capabilities in terms of content, data types and protocols. That also effectively moves the interactivity away from the Web server and onto the Web client.



In terms of content this means that, anyone browsing the Web who comes across a page containing an applet could use and interact with that applet in real-time. Once again this is because the program or applet is sent automatically over the network and resides on your computer just like any other application you have on your computer. There is currently a growing popularity of applets on the Web that range from animation to spreadsheets.

HotJava is small compared to traditional browsers since all the protocol and data handlers are brought in off the network when needed. For data types that means that when the browser comes across something that it doesn't recognize, a look for the appropriate handler on the server, as long as it is there in Java code, the browser will upgrade itself on the fly and display the new data type. We need for all these helper applications. Protocol handlers get installed in a fashion similar to data providers. HotJava is given an object reference, an URL. If the handler for that protocol is already loaded, it is used. If not, HotJava

queries the local system and then the system that is the target of the URL. For the protocol needed to interact with the object, it then incorporates dynamically. This means you will not need multiple browsers to access data on different servers each with its own proprietary protocol. Also, vendor's products will integrate more smoothly with each other, saving great pains for themselves and their users.

Security is of great importance when dealing with a large and heterogeneous network such as the Internet. When you are downloading, installing and running fragments of code imported from all over the place there are obvious dangers. HotJava incorporates all the security measures built into Java, which were described earlier. Could a computer virus get through Java's security measures? Only time will tell.

In Summary

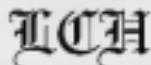
Is Java C++ done right? The jury is still out. Java is a very new technology, in its early stages of development. Considering Java was only introduced six months ago its off to a strong start. It has already gained widespread acceptance and support throughout the Internet community, and is aiming to become the universal standard for transfer of dynamic, executable content over the Web. An impressive list of companies have signed up to license Java, including Netscape and Microsoft.

A developer conference I recently attended at San Francisco was packed with Java enthusiasts. Who knows what applications will be developed over the next year by these people. It could be used as the principle engine for interaction and behavior of objects on the next version of VRML. It could be used to provide all kinds of stand-alone applications which are retrieved over the network, used and returned. It could be used in any number of innovative ways because of its dynamically extensible and portable nature. Ladies and gentlemen, start your engines... let the revolution begin! ☐

About the Author: Dan Doherty is a computer consultant and programmer. He can be reached at doherty@direct.com



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Things you didn't bargain on -

Terms the Law includes in your Agreements

by Gary Dunn

Most of us acknowledge that written agreements have a place in business.

In the computer supply business, I think we are seeing a shift away from manufacturer's representatives and hardware suppliers to an industry of VAR's and systems integrators. Clients are looking more for solutions than hardware. All of which increases the likelihood of unmet expectations and the awaiting disputes.

My focus as a lawyer is to help parties reach and document their agreements. I believe that any agreement has to meet the needs of all parties to the transaction. It is tempting in the face of a potential sale to avoid a full discussion of all of the purchaser's needs. My belief is that a full discussion of the issues can only enhance the chances that a project will be successful, and that reducing the parties' respective commitments to writing increases the likelihood that the commitments will be kept. As you would expect, I encourage contracting persons to follow this strategy on the basis that "an ounce of prevention is worth a pound of cure."

But not every arrangement is fully or even adequately documented. And disputes can and do arise. When they do, the law often includes terms in the agreement by implication. You might find a summary of some of the decided legal cases informative.

Before reviewing them, a bit of the basics. A dispute can be based on specific terms of an agreement, or on terms implied by law. The latter are not actually included in the written portion of the agreement. Most commonly, these arise from the *Sale of Goods* legislation in your jurisdiction or, in the United States of America, from the Uniform Commercial Code (UCC).

Legislators in the U.S.A. are also currently examining the UCC with respect to the degree of protection that a purchaser of "shrink wrapped" software should get. I am

advised that legislative changes can be expected, although not as consumer driven as we might expect.

The most common *Sale of Goods* implied warranties arise when the goods are sold on descriptions, or if the purchaser relies on the skill and knowledge of the vendor. When goods are sold based on their description, an implied warranty that they will meet the description arises. Additionally, an implied condition that the goods will be of merchantable quality might also apply. This means that the goods will pass the test if, after examination and knowing of the defects in the goods, a reasonable person would still purchase them. Lastly, if the purchaser can show that she relied on the skill and knowledge of the vendor, an implied warranty that the goods will be fit for the purpose they were purchased for will apply.

If your project is characterized as a sale of goods, there can be an implied warranty that the system will be fit for the purpose that the purchaser specified.

If the purchaser does inspect the goods, and then accepts them, she can lose the protection of some of these implied warranties.

A sale of goods is distinguished from other arrangements, such as agency relationships and contracts for the provision of work and materials. To the extent that all or a portion of a contract is characterized as a contract for services, your obligations might be limited to having to perform the work with reasonable skill and care, and in a good and workmanlike manner.

What this means is that if you are selling work and materials, you must use a reasonable amount of effort to successfully assume that you

are competent in the first place, but the outcome need not work exactly the way the purchaser wants it to. On the other hand, if you represent to the purchaser that you can provide a solution, you might find yourself in a *Sale of Goods* transaction where the system must be fit for the purpose for which it was purchased.

As an aside, the limitations of warranty commonly found in shrink wrap licenses are usually unenforceable. The common reason for this is that the clause was not available at the time of the purchase (for example, sealed inside the package with the license) - in other words, the purchaser was not given notice of the clause. The same can apply to any warranty limitations that you wish to rely on. The customer must be made aware of the limitations before the contract is made - and in some cases these limitations of liability might not be enforceable if they are viewed as being contrary to public policy.

Implied terms can apply even if your agreement is not in writing.

A brief taste of three of the cases decided in the last few years:

A building supply business contracted for the design of an inventory control, point of sale, and accounts receivable system. As it turned out, the system as designed could not handle the complexity or amount of inventory. The defendant was also accused of not providing the necessary assistance. In other words, the system was not fit for the purpose the business wanted it for. Damages were awarded sufficient to put the business in the position it would have been in had the contract had not been entered into.

In another case, also involving inventory control and point of sale equipment, the store owner also claimed that the system sold to it was not fit for the intended purpose. It turned out that in addition to requiring a system that could handle the functions of a retail store, the store owner ran a substantial jewellery repair

business. In this case, the court ruled that the burden of proof is on the store owner to prove that it made its purpose known. The court went so far as to say that the store owner knew all about the requirements of its business and was under no obligation to communicate this information. The action was dismissed based on the failure of the store owner to provide this information.

In a third case, the defendant was compensated to design and install a system for use in a retail computer store business. The owner of the business knew that the defendant had never designed a retail computer software system before. The defendant wanted to get into this part of the software business, and was prepared to do the work for a significantly discounted price. The defendant gave strong assurance that it would be able to accomplish the task. The system never did work, for many reasons. Again, the court decided that the defendant failed to supply goods reasonably fit for the purpose intended. The court went on to say

that the owner of the business never agreed to participate in an experiment that would disrupt his business. The owner of the business was awarded all of its expenses flowing directly from the basic agreement between the parties.

Looking at it from the point of view of a seller by disclaimer, even if you are only selling a few basic warranties, it might pay to specify in the purchase order all of the details that are relevant. You might want to go so far as to include exact product specifications to ensure that the customer does not claim that she got evaluated or non brand name components, chips, etc., different from what was described.

A full discussion of risk allocation before starting a project can avoid terms being implied into your agreement that were not bargained for or that are different than you intended.

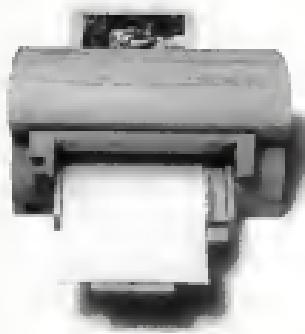
The message is the same, regardless of the amount of compensation involved. To the extent that the purchaser wishes to rely on the supplier, there is an obligation on the purchaser to clearly set out the purpose for which the products are purchased. And in the case of the supplier, there is an obligation to deliver a system that meets the purchaser's needs as they are expressed. In a sale of Goods transaction, it is not enough to give it your best shot and then fail.

To put it another way, it is usually in both parties interest not to hurt the other. If both parties recognize that beyond their own self interest they have an obligation to fully explore the issues, the temptation to just make the sale and grind the best price can be avoided - and the relationship can do nothing but improve as they fail.

Gary Bass practices law in Vancouver, specializing in intellectual property and licensing. He can be reached at (800) 739-7011 or at garry@shaw.ca.



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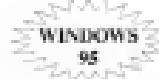
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Epson announces color digital camera under \$750

The Epson PhotoPC looks and feels like a standard 35mm camera. It measures 6.6 x 3.3 x 1.9 inches. It captures 24-bit images in 16.7 million colors at 840 x 640, 320 x 240 resolutions. The PhotoPC has a built-in 1MB of flash memory that can store 16 high resolution or 32 standard ones. Memory can expand to store 180 standard images. The camera accepts an 8mm video camcorder lens or filter, allowing the option of wide angle and telephoto lenses. The flash works from 3 to 10 feet. It comes with cable to PC and EasyPhoto from Stereo Software. EasyPhoto provides image management and image enhancement capabilities. Macintosh version expected in spring of 1996. SRP: \$750.

Epson web site: <http://www.epson.com>

Aigis launches TwinPlate scanning technology

Aigis launched DualScan, a scanner offering true optical resolutions of 1,000 x 1,000 dpi and a color scanning depth of 36-bits, at Vancouver's COMDEX/Fall '95 computer exhibition. The 8,000-element CCD offers 1,000 dpi over a 1-inch width, by controlling the stepping motor, it can produce true resolutions of 2,000 dpi and have interpolated resolutions to 4,000 dpi. The TwinPlate design allows the user to scan reflective art and transparencies on separate scan beds for independent control of the total length of the optical path. To eliminate optical aberration, the glass plates between the lens and the transparent original were removed. To synchronize the transparency layer and the CCD carriage, a factory-adjusted, fixed carriage is used to determine the exact optical path.

DualScan comes with a universal film holder frame and slide holder and the high CD-ROM which contains PhotoView 2.65 scanner driver, PhotoFlavor color correction software, and a full version of Adobe Photoshop in Mac, Windows formats. PhotoTone color management software, QuarkXPress, PhotoShop color calculator and ColorSync 1.0 and ICC profiles. Options include film holders for back-scanning. SRP: \$1,750.

Lotus SmartSuite 96 Edition for Windows 95

Lotus Development Canada Ltd announced that SmartSuite 96 Edition for Windows 95 will ship beginning in February. SmartSuite includes completely enhanced 32-bit versions of the Word Pro word processor, Freelance Graphics presentation graphics, Approach database and SmartSuite was composed entire, as well as updated versions of the 1-2-1 spreadsheet, Organizer personal information manager and Symantec anti-virus tool. The new program features 32-bit multitasking, long file names, GZIP 2.0 support and integration with the Windows 95 desktop shell.

SRP for SmartSuite 96 is \$590 and personal users of Lotus programs can upgrade for \$295.

Digital screen offers more transactions per dollar

Digital Equipment Corp and Microsoft Corp announced the world's first TPC-C benchmark prior/performance results for a single-processor system.

Results of 1153.7 transactions per minute (tpmC) at US\$2.24tpmC, based on the TPC-C benchmark Revision 3.0, were achieved on the uniprocessor AlphaServer 1000 4300 system running MS Windows NT Server OS V3.51 and MS SQL Server V6.5 client/server database management system in a heterogeneous client/server environment.

With a total system cost of US\$364,663, the AlphaServer 1000 4300 system delivers 55% better throughput performance and US\$1.44tpmC less than the IBM RJE6000 620. It also delivers superior performance and prior performance to the dual-processor Sun SparcStation 20.

Fujitsu ships 10 and 14 ppm printers

Fujitsu announced the availability of the PostPrinter 10 and PostPrinter 14, the 600 dpi, network-ready laser printers with 200 dpi class printing capabilities and speeds of 10 and 14 ppm respectively.

Users can select true 300 and 600 dpi or 1200 dpi class printing. It also uses advanced memory techniques to process more information with the same amount of RAM. Standard features: 3 MB RAM using 72-pin SIMMs for up to 34 MB, 256 sheet letter tray, high-speed bi-directional parallel interface, PCI 3.0 controller, 15 fonts, 10 TrueType, and 1 bitmap font.

The 600 dpi printer, replaces 1200 dpi with Fujitsu Enhanced Imaging Technology. The printer is also capable of producing MICR or magnetic ink documents for banking cheques.

SRP is \$1,895 for the PostPrinter 10 and \$2,145 for the PostPrinter 14.

Claris ships Oracle Power Objects

Claris Canada is now shipping Oracle Power Objects, the first visual programming tool to support cross-platform development on Windows and Apple Macintosh platforms simultaneously.

Developed by Oracle Corp and marketed by Apple Computer, Oracle Power Objects allows developers to easily move applications from one system to another without recoding. Power Objects runs simultaneously in Windows 3.1, Windows 95 and Macintosh environments.

Oracle Power Objects Standard Edition 1.0 has an introductory price of \$119 and Oracle Power Objects Client/Server Edition 1.0 has an estimated street price of \$4,995.

Sharp PDA has backlit screen

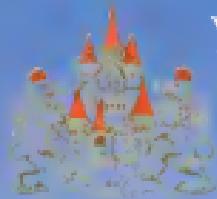
Sharp Electronics of Canada is introducing a new Zaurus keyboard-enhanced personal digital assistant with expanded on-line communications and PC connectivity. The Zaurus 28-3400 offers connection to on-line data services and to the Internet. The 28-3400 includes Comprehensive Companion for Zaurus, AT&T Mail, Pager Access, and PenCell, a Microsoft Excel compatible spreadsheet. It also has 2 MB RAM with 1.6 MB for user space and can be expanded with another 2 MB with a SIMM card. Also new is the on-screen backlight enabling users to work with the unit in dark areas. Users can also use Microsoft Mail or Lotus cc:Mail for sending e-mail and other documents by infrared, modem or cable connection. Word processing documents on the 28-3400 are in Rich Text Format and can be edited in MS Word without reformatting. Weighing 343 g (12.0 ounces) the unit is powered by 2 AAA batteries.

Perle 833 for IBM remote access

Perle Systems announced the availability of a Token Ring version of its Perle 833 Remote Access Server. The current version is deployed by organizations to allow mobile users dial-up access to mission-critical resources on Ethernet LAN segments.

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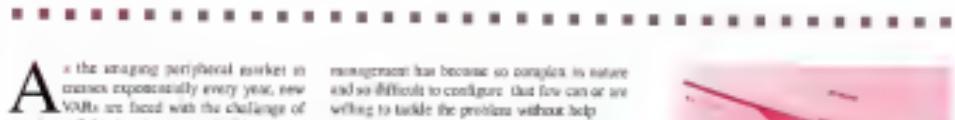
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As the imaging peripheral market increases exponentially every year, new VARs are faced with the challenge of entering a field already saturated with players. Competition is fierce and continues to be so even after becoming a member of the team, because older, more experienced VARs command a large portion of the game, and more players join every day.

But don't become disengaged. Imaging is an emerging market and for new VARs who are willing to develop a sound business plan and make the commitment, the opportunities are there.

The information age, as it has been characterized, represents another stage in the evolution of the corporate world. With the demand for information growing at an alarming rate, the need to organize and access the information must also grow.

Unfortunately many companies who depend on the storage, quick search, retrieval, and delivery of information are still heavily reliant on out-moded manual methods. As improbable as it may seem, many of these

management has become so complex in nature and so difficult to configure that few can or are willing to tackle the problem without help.

Providing the much needed help to these corporations is where the opportunity for you, the imaging VAR, comes in, but only if you understand that imaging and record management is not just about selling hardware.

The most important fact to keep in mind when marketing as a VAR is that your clients need help sorting through the confusing array of products and information available. Arm yourself with the right knowledge and the attitude that will enable you to become a consultant to your clients and soon you will be well on your way to establishing long term relationships, which in turn can result in future sales.

Because scanners are often the main component of an imaging solution, learning all that you can about them is a good place to start building your knowledge base.

You will find that frequently customers negotiate their need for a scanner but have little idea of what it can really do for them or how it

Selecting the right Scanner

The scanner is at the front of the imaging solution process. Its productivity can be critical to the success or failure of the solution. Determine what level of productivity your client needs and then be relentless about finding the right product for the job.

There are many issues to consider such as: what type of documents are being scanned and what the daily volumes are. If it's for personal use, scanning no more than 100 documents per day, a flatbed scanner may be the answer. However, when volumes run into the thousands, a production level scanner is required.

Some of the issues you will need to consider:

Selling imaging solutions to the paper challenged

by Malcolm Cooks

companies are still using filing cabinets for information storage and

data, searchers often waste time constantly manually labouring. Millions of dollars are lost in unproductive searches for essential information in this way.

Of course, many corporate executives are well aware that inefficient document management is costing their firms valuable time and profits. However, understanding the problem and doing something about it are two different issues. Even the executives who are aware of the existing technology are afraid to tackle the problem on their own. Transforming information into computer-useful data is no easy task. Document

might fit into the "bigger picture." You can help, but be careful. A common mistake is an attempt to sell a scanner to fit a client's application without knowing if it's the correct solution. Take the time to verify that the client actually needs the scanner and which type will work the best. You not only act as consultant, and make sound recommendations after completely observing and understanding your client's imaging problem.

Helping your customer understand how a scanner can benefit them and how it can become part of the total solution has its rewards. Selling the right scanner is part of an over-all solution can become your window of opportunity. This is your chance to level the playing field and even take a lead in the imaging industry.

Fortunately, today's scanners offer such a variety of features that, with a little homework, you should have no problem matching the needs of your clients with the right scanner solution.

Throughput

Throughput refers to the speed at which the pages enter the system, measured in pages per minute. Important though this is, you must not overlook a very important factor—operator involvement. Scanners designed with the operator in mind can greatly improve throughput.

Consider that in many environments the operator will be scanning for most of the day, is the height and positioning of the scanner comfortable to ensure maximum productivity? Does the feeder have front feed and return to eliminate awkward searching? Remember that no matter how fast the scanner is, if valuable time is spent reaching from one end of the scanner to the other, the net result could be decreased productivity.

Paper Handling

Don't get bogged down with all of the different types of mechanisms available for feed-

(Continued on page 20)

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(Continued from page 24)

ing documents through the scanner. Bleeding is the real issue. The transport should be measured as its ability to efficiently handle the types of documents that your client is likely to have with minimal jamming.

We realize about the shape and condition of the materials to be handled. Investigate what kinds of documents are to be scanned and unscanned and choose a source that can best accommodate the types of paper and the condition of the materials that will be scanned. It should be one that understands jamming and one that can be cleaned and put back into production quickly.

It is also good policy to understand the basic repair procedures for a given scanner in the event of a possible paper jamming problem. As a rule, you may have simply advised your client to buy a particular scanner but most likely you will be the first person contacted when something goes wrong.

Demonstrating your knowledge and being able to help solve the problem is yet another opportunity to provide the kind of service that will make you stand out.

Image Quality

Image quality and readability is crucial to consider when proposing the right imaging solution. The scanner you choose should include image enhancement technology. It is important for the operator to have the ability to sharpen blurred images, eliminate marks and adjust contrast to equal or better the quality of the original document.

The quality of scans can be the determining factor in the success of your "imaging solution." The latest scanner in the world won't compensate for the loss of time in having to redo poor quality scans.

Another point to note is to be sure that the

scanning quality you are recommending is what is required. Although in theory, the more dpi per inch, the better the final results, depending on the circumstances, less dpi may do just as good a job. For example, 200 dpi is a logical choice to use for waybill or invoice scans, instead of a higher dpi value. This lower dpi would expedite production time, while maintaining quality at an acceptable level.

If the system does not have good image enhancement technology or if it is operating too high a dpi and slowing down the operation, your client may lose money and hold you responsible.

Operator Ergonomics

Whether using the scanner for a few hours or for long extended days, it is important to provide proper ergonomic conditions for the operator. An efficient and comfortable environment can be achieved with features such as remote, two-side paper output choices, adequate work space, and paper scanner height.

It is essential that there is enough room to manipulate the scanned images and the originals, because maneuverability and paper handling simplicity will ensure positive work conditions.

Ergonomic considerations may seem obvious to you but your client will appreciate this type of value-added information from you.

Reliability

The reliability of a scanner can be measured by the number of pages it can scan in a given number of hours per day. After all, it is necessary to know just how well the scanner will perform and at what rate, without overworking either the scanner or the operator.

When recommending a scanner, it is common sense to know the manufacturer's history

DOCUMENT IMAGING TERMINOLOGY

Binary - Image data where each pixel can have a value of black or white, but no other values.

Batch Duty Cycle - The maximum number of documents that can be scanned per day as specified by the manufacturer.

DPI - Dots per inch. The number of pixels generated per inch of paper. The higher the dpi number, the longer it will take to scan but the image will have a higher resolution.

Duplex - The capability of a scanner to scan two sides of a page.

Grayscale - In grayscale each pixel is assigned a value of gray, or black. These files are 8 times larger than uncompressed black and white data, and more than 10 times larger than compressed black and white data.

ICR - Intelligent Character Recognition ICR technology recognizes hand-written characters and translates the scanned images into ASCII characters.

Image Enhancement - Image enhancement is a feature built into the scanner or on the host computer. It allows the operator to clean-up the images by increasing clarity, adjusting contrast, de-skewing and so on. It usually involves manipulating the image by software.

OCR - Optical Character Recognition - This software allows a scanned, printed character image of black and white dots, to be translated into an ASCII character to be used as a word processor.

(Continued on page 56)

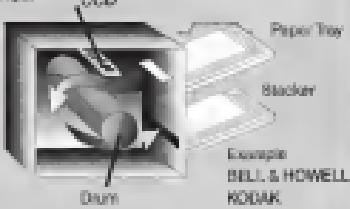
A Look at the different scanner transport and how they get the paper past the CCD

Figure 1: ROLLER



The document goes between two rubber rollers and is sent across the CCD array.

Figure 2: DRUM



Takes the document on a drum past the CCD. Advantage returns the paper in front of the operator after scanning.

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(Continued from page 20)

and commitment to service. The reliability of a scanner could be greatly undermined if the repair service is unreliable and expensive.

It is probably not a good idea when dealing with revenue critical applications to recommend a new scanner without a track record.

A final word

Making the effort to be informed might seem time-consuming and even bits playing on the side-lines than on the actual playing field but it is the key to saving yourself space and ensuring your success.

Selling a scanner into a company can open doors, but, a full scale imaging solution raises much more than just a scanner sale for you. If you play your cards right, the total sale can include workstations, network upgrades, special disk drives for storage, high-resolution monitors, application software as well as consulting and integration fees. ☐

Markus Cechko is the National Sales Manager for Bell & Howell Imaging Peripheral Products Division (403) 239-6700

A look at the different scanner transport and how they get the paper past the CCD

Figure 3 STRAIGHT-THROUGH (roller)

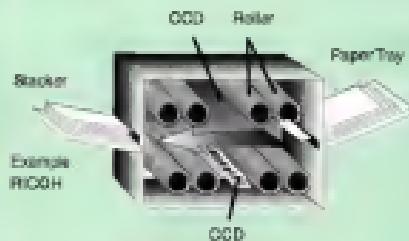
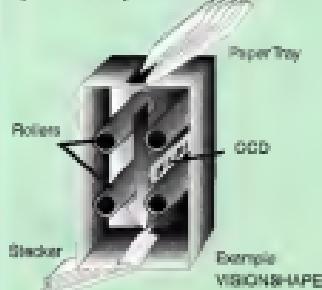


Figure 3A STRAIGHT-THROUGH (roller-vertical)



The type of transport is the same as number 3, only in a vertical position.

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Figure 4 BELT STRAIGHT-THROUGH

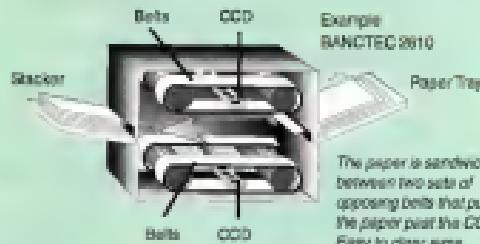


Figure 5 VACUUM STRAIGHT-THROUGH



This kind of transport uses a vacuum to hold the paper against the belt as it passes the CCD. Fine double feeds

DOCUMENT IMAGING TERMINOLOGY

Pixel - The smallest component of an image. Each character is made up of many tiny pixels, and every image is made up of thousands of pixels.

PPM - Pages-per-minute. The number of letter size documents that can be scanned every minute.

Production Scanning - Masses copies, high-end scanning with a large volume of documents which contain dated or very important information.

Rated Speed - The speed at which the scanner operates, as a defined dpi value. (Remember: the greater the dpi, the slower the scanning speed.)

Simplex - The capability of a scanner to scan only one side of a page.

Thresholding - A method to direct the scanner when to treat gray values as black and when to treat them as white. This is necessary when converting grayscale values (black, white or gray shades), to binary values (only black or white).

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Frequently Asked Questions:

Cyrix 6x86 Processor

Information from Cyrix Corp.

What is the Cyrix 6x86 processor?

The 6x86 processor, formerly the M1, is a ninth-generation superscalar, superpipelined, 32-bit software-compatible processor.

How does it differ from the Pentium processor?

Most significant are the architectural differences which result in the 6x86 processor's superior performance gains. While both the 6x86 and Pentium processors are superscalar and contain an 80-bit floating point unit and a 16-KByte primary cache, other architectural features are found only on the 6x86. The 6x86 processor's integer and floating point units are optimized for maximum instruction throughput by using advanced architectural techniques

including register renaming, out-of-order execution, data dependency removal, branch prediction and speculative execution. These design innovations eliminate many data dependencies and resource conflicts to achieve high performance when executing existing non-recompiled software programs as well as future 32-bit-compatible code. And while the 6x86 processor achieves superior performance with existing software, it takes advantage of any recompiled code to gain an additional 5-10% performance increase.

What is the difference between the Cyrix 6x86 and 8x86 processor?

There are significant differences between these two Cyrix processors. The 6x86 pro-

cessor, formerly the M160, is pin-compatible with a 486. However the 6x86 has many fifth-generation features (branch prediction, data forwarding, superpipelining, etc.) to achieve performance equal to Pentium processors. The goal for the 6x86 was to achieve an efficient design, obtaining the highest performance possible using the fewest instructions to obtain entry-level Pentium processor performance. A 100MHz 6x86 performs as fast with a 75MHz Pentium processor.

The Cyrix 6x86 processor is a high-performance, ninth-generation CPU that is FPUC socket-compatible. It incorporates a 64-bit external data bus (5x86 uses a 32-bit external data bus) and a variety of massive

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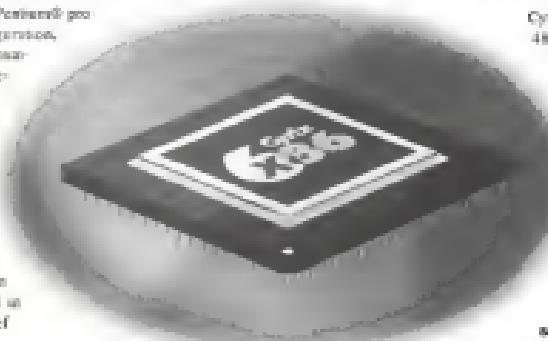
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architectural features that enable it to outperform higher-megahertz Pentium® processors. Superior configuration, superpipelining, register renaming, data dependency removal, multi-branch prediction, speculative execution and out-of-order completion. These advanced architectural techniques eliminate many data dependencies and resource conflicts inherent in other processor designs. Additional design information can be found in the 6x86 Architectural Brief.

What are the performance results for the 6x86 processor?

Cyrix has full 6x86 performance results for several benchmarks on their Web site. Overall, the tests show that the 6x86 100 processor ranks published test results for the fastest 133 MHz Pentium systems.



Can the 6x86 processor run 16-bit and 32-bit software?

Yes. The 6x86 was designed to run existing 16-bit software as well as new 32-bit software.

How can I purchase the 6x86 processor?

Cyrix processors — 6x86, 5x86 and 486 families — are sold only to manufacturers directly in volume quantities, and through distributors to qualified dealers and integrators who build and sell new Cyrix-based PCs. Cyrix does not market these products directly to home computer or business users as processor upgrades.

Is the 6x86 processor compatible with the existing software?

Yes. At Cyrix, the foundation of our innovative, high-performance processor is full compatibility both with emerging and existing software. With millions Cyrix processors shipped and eight original architectures in use today, Cyrix has demonstrated its expertise in creating fully compatible, advanced processor designs. □

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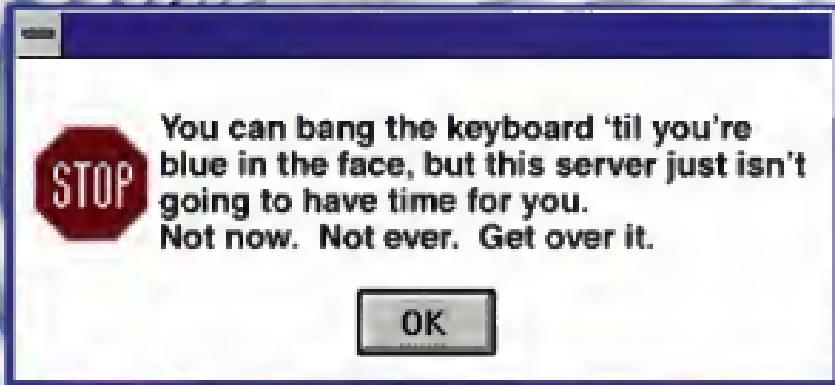
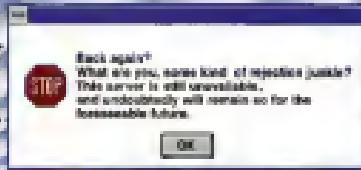
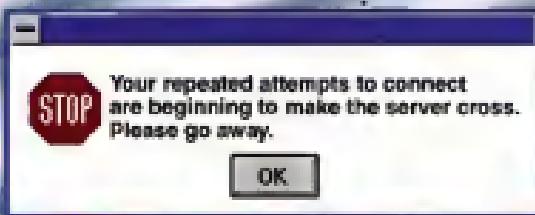
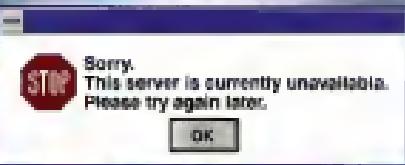
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Digital and ISDN modems

by Sean Edmiston

Over the past year or so things have gotten either complex when it comes to modems. Many telecom vendors are now promoting "digital modems" with their routers and other remote access equipment. What is a digital modem? Unfortunately, the term "digital modem" can refer to three different things, a CSU/DSU, an ISDN TA/NTI or a modem capable of receiving digital bits in and out with the analog modulation/demodulation being done internally.

A bit confused? Hang in there.

A true analog modem can only run up to 33,600 bits per second over ordinary telephone lines. Dedicated or switched circuits running faster than that will typically use a Channel/Ser-

vice Unit/Digital Service Unit (CSU/DSU) on the line. These units power the line and look much like an ordinary data centre modem. Because the link is digital from end-to-end, there is no need for an analog signal so CSU/DSUs are not really true modems. Nevertheless, many people do refer to them as "digital modems".

An ISDN (Integrated Services Digital Network) TA and NTI are often combined into one unit and sometimes called a "digital modem". The NTI (Network Termination Unit One) provides power to the line and takes the 2-wire ISDN line in through a "U" interface and converts it into a 4-wire line. The output to the TA goes through an "S/T" bus.

If you buy a device with an "S/T" interface you will also need to buy an external NTI. If you are buying a router with a "U" interface then you can usually just plug the phone line directly into it.

The Terminal Adapter (TA) takes the 4-wire line and connects it to a router or other communications equipment. The TA also performs some control functions on the line such as "locating" the two 64,000 bit per second ISDN B channels (160,000 bits per second channel). The TA and NTI are often combined into one unit and some times even incorporated into a router.

Most recently, the term "digital modem" has come to mean a modem which receives digital input and also has digi-

tal output. A brief digital-to-digital conversion is done within the modem but the output is digital. A normal analog modem typically receives digital input and outputs an analog wave.

Why would someone require such a modem? Imagine that you are an Internet Service Provider (ISP) with a mix of clients. Some call in digitally, using dedicated lines or ISDN, and some customers call in using analog modems. You could run separate modem pools with TA/NTIs, CSU/DSUs and analog modems but that is rather cumbersome. Also, you may have chosen to consolidate all of your incoming calls onto a high bandwidth digital line like a T1.

Handling your digital calls is straightforward enough, but what about your analog dial-up customers? The modem at the customer's end is encoding the original bit stream from their computer as an analog wave and sending it over the phone line. At the telephone switch the call becomes re-digitized and it remains digital thereafter as it travels through the phone system and is delivered to your ISP via a digital phone line like a T1 link. In order to decode the call a modem must turn the phone company's digital bit stream into an analog signal and then re-digitize it into a form that the router can use. A digital modem does this conversion internally resulting in a digital-in, digital-out process.

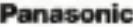
Another common related phrase is "ISDN modem". This typically refers to a TA/NTI unit, however some vendors have started to put both an analog modem and a TA/NTI in one unit. Some ISPs suggest these units to their clients because it allows ISPs who can only receive analog calls now to upgrade to ISDN in the future without their clients having to buy new equipment. It also allows people like telecommuters, who have ISDN residential lines, the ability to dial into bulletin boards and other "analog only" services. □



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by Gert Malekis

Simplifying the Networks of the Future

ATM (Asynchronous Transfer Model) is widely touted as a hot new technology - the all-swinging-all-dancing tool to usher in the next generation of the networking. It may come as a surprise to the average user to learn that the true beauty of ATM actually lies in its potential to eliminate complications in network design.

If fact, the inherent simplicity of ATM is what sets it apart from existing networking technologies. Its scalability and bandwidth exotic the simplification of network design - and this simplification should be the goal of any organization wishing to reach maximum operating efficiency.

By providing an order of bandwidth that is considerably more than is needed, ATM can return networking to the tone when the network was manageable and management was simple. When questioning the need for ATM in production networks, detractors of the new technology often argue that the majority of applications commonly used do not need the magnitude of bandwidth provided by ATM; this is a fundamental misunderstanding of the benefits of bandwidth in the network.

Bandwidth provides simplicity - when there is more bandwidth than is needed, it is easy to design a network to meet the needs of the organization. Complexity is introduced when lack of bandwidth forces the network manager to distribute and redistribute bandwidth, constantly redesigning the network to match the organization's changing demands. In short, networking gurus are needed to successfully design and maintain networks that suffer from bandwidth constraint, and gurus are by definition expensive to employ and always in short supply.

With its tremendous bandwidth and quality of service, most of the hype around ATM is based on its potential for internetworked and seamless LAN, MAN and WAN networks. Yet ATM's most practical application with most benefit to users today is in the campus/building backbone. ATM at the backbone provides three major benefits:

it works with the existing installed base of network equipment; it is standards-based and will promote full interoperability across the industry; and it reduces the cost of ownership. Reducing bandwidth congestion in high-traffic LAN networks goes a long way toward solving most corporate networks' immediate problems, and reliable ATM-based products at reasonable prices are now available.

Meeting the dual challenge of offering practical solutions today while keeping a few steps ahead of growing corporate networks, ATM technology promises to carry contemporary network design forward into the next generation. □

Gert Malekis is General Manager of JCom Canada in Toronto.



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A Generalized Way of Thinking About Multi-Tier Client/Server Architectures

by George Schaeuel

By now most people use the term "client/server" when talking about group computing with PC's on networks. PC network computing, of course, evolved before the client/server model started gaining acceptance in late 1980's. These first PC networks were based on the file sharing metaphor illustrated in Figure 1. In file sharing, the server simply downloads or transfers files from the shared location to your desktop where the logic and data for the job run in their entirety. This approach was popularized mostly by Xbase style products (dBASE, FoxPro and Clipper). File sharing is simple and works as long as shared usage is low; update contention is very low and the volume of data to be transferred is low compared with LAN capacity.

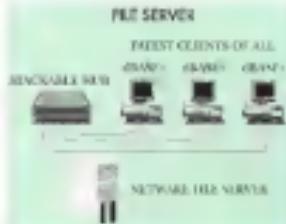


Figure 1

was the emergence and then dominance of the GUI metaphor on the desktop. Very soon GUI presentation formats, led by Windows and Mac, became mandatory for presenting information.

The architecture and technology that evolved to answer this demand was client/server, in the guise of a two tiered approach. By replacing the file server with a true database server, the network could respond to client requests with just the answer to a query against a relational DBMS (rather than the entire file). One benefit to this approach, then, is to significantly reduce network traffic. Also, with a real DBMS, true multi-user updating is now easily available to users on the PC LAN. By now, the idea of using Windows or Mac style PC's as front end to a shared database server is familiar and widely implemented.

most business rules that are better suited to run on the server than the client

The result is a much more efficient overall system.

Since 1992, software vendors have developed and brought to market many tools to simplify development of applications for the 2-tier client/server architecture. The best known of these tools are Microsoft's Visual Basic, Borland's Delphi and Sybase's PowerBuilder.

The 2-tiered client/server architecture has proven to be very effective in solving workgroup problems ("Workgroup", as used here, is loosely defined as a dozen to 100 people interacting on a LAN). For bigger enterprise-class problem and/or applications that are distributed over a WAN, use of this 2-tier approach has generated some problems.

Client/Server in Large Enterprise Environments

What typically happens with client/server in large enterprise environments is that the performance of a 2-tier architecture degrades as the number of on-line users increases. The primary reason this occurs is due to the connection process of the DBMS server. The DBMS maintains a thread for each client connected to the server. Even when no work is being done, the client and server exchange "keep alive" messages on a continuous basis. If something happens to the connection, the client must go through a session reinitializing process. With 50 clients and today's typical PC hardware this is no problem. When one has 2,000 clients on a single server however, the resulting performance isn't likely to be satisfactory.

The industry has responded with a layered software solution for executives who need

(Continued on page 38)

As PC LAN computing moved into the 90's and the birth of today's client/server computing, two things happened. The first was that these first generation PC LAN applications and their users both grew, sometimes straining the capacity of this technology. Multivendor Xbase technology can provide satisfactory performance for up to 50 users, but it's very rare to find a successful implementation of this approach beyond that point. The second change

in a 2-tier client/server architecture, as shown in Figure 2, RPC's or SQL are typically used to communicate between the client and server. The server is likely to have support for stored procedures and triggers. These mean that the server can be programmed to imple-

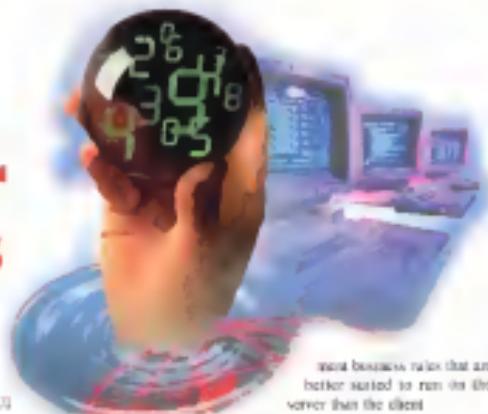


Figure 2

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(Continued from page 38)

more scalability and performance than the 2-tier architecture can provide. The idea is to insert a third, middle layer of queuing software between the client and server. The result, then, is that the synchronous process of the 2-tier approach becomes asynchronous. In addition, the middle layer aids scheduling and prioritization for the work in process.

The use of an architecture with such a middle layer is called "3-tier" or "multi-tier". These two terms are largely synonymous in this context.

3-Tier With a TP Monitor

One type of middle layer is the transaction processing monitor or TP monitor. You can think of a TP monitor as a kind of message queuing service. The client connects to the TP monitor instead of the database server. The transaction is accepted by the monitor, which queues it and then takes responsibility for managing it to correct completion.

TP monitors first became popular in the 1970's on mainframes. On-line access to miniframes was available through one of two metaphors - time sharing or transaction processing (OLTP). Time sharing was used for program development and the computer's resources were allocated with a simple scheduling algorithm like round robin. OLTP scheduling was more sophisticated and priority driven. TP monitors were almost always used in this environment, and the most popular of these was IBM's CICS (pronounced "kicks").

3 TIER TP MONITOR

PRESENTATION LOGIC ON PC/T1/E1/HUBS

RECONFIGURABLE HUB



Figure 9

As client/server applications gained popularity over the early 1990's the use of TP monitors dropped by the wayside. That happened principally because many of the services provided by a TP monitor were available as part of the DBMS or middleware software provided by vendors like Sybase, Oracle and Oracle. These embedded (in the DBMS) TP services have acquired the nickname "TP Link". The "Link" term comes from experience that DBMS

based transaction processing works OK as long as a relatively small number (<100) of clients are connected.

TP monitors (TP Heavy) have stayed a comeback because their queuing engines provide a buffering effect, reducing the number of threads a DBMS server needs to maintain. The client connects with the monitor, which accepts the message and queues it for processing against the database. Once the monitor has accepted the message, the client can be released for further processing. The synchronous session based computing of a 2-tier architecture, then, becomes asynchronous through the insertion of the TP monitor into the equation. The monitor smooths out and lowers the overhead of accessing the database server.

Some other key services a monitor provides are the ability to update multiple different DBMS in a single transaction, connectivity to a variety of data sources, including flat files, non relational DBMS and the mainframe, the ability to attach priorities to transactions, and robust security, including Kerberos. The net result of using a 3-tier client/server architecture with a TP monitor is that the resulting environment is FAR more scalable than a 2-tier approach with direct client to server connection. For really large (e.g., 1,000 user) applications, a TP monitor is one of the most effective solutions.

As you might expect, however, there is a downside to network-based TP monitors. At this point in time, the major problem with using this approach is that the code to implement TP monitors is usually written in a lower level language (like COBOL) and support for TP monitors is not yet widely available in the most popular visual toolkits like PowerBuilder or Visual Basic.

3-Tier With an Application Server

Another type of 3-tier architecture is the application server (illustrated in Figure 10). With this approach, most of the application's logic is moved from the PC and onto a common, shared host server. The PC is basically used for presentation services - just unlike the role that a terminal plays on a mainframe. Of course, because we are talking about a real PC here it still has the advantages of being used for client-side application integration (via OLE or other approach) if desired.

The application server approach is similar in overall concept to the X architecture that was developed at MIT in the 1980's. In X the goal is to allow host based computing with graphical interfaces on the desktop (I'm using the term "desktop" here because in the X architecture, the term "server" refers to the graphical server which sits on the desktop and

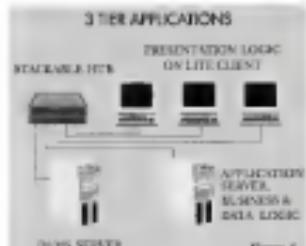


Figure 10

the term "client" refers to where the application runs - on the shared host).

The similarity between X and a 3-tiered client/server architecture with an application server is that both architectures have the goal of pulling the main body of application logic off the desktop and running it on a shared host.

The application server is also similar to a mainframe in that it doesn't need to worry about driving a GUI, and therefore it's a shared business logic, computation and data retrieval engine. This server normally operates under a 32 bit multitasking OS like NT, OS/2, NetWare or UNIX. As an option, these OS's all run on symmetric multiprocessing (SMP) configurations. In addition, some are suitable on massively parallel hardware. Therefore, the server is very scalable in terms of performance.

As new versions of the application software are developed and released, the installation of that software occurs on the one server rather than hundreds or thousands of PCs.

3-Tier With an Object DBMS

A variation on this theme of application server is the idea of using an object DBMS (ODBMS) as the middle layer. In this sense, the ODBMS acts as an accelerator or "hot cache". Data in a relational DBMS is usually stored in normalized fashion across many tables and for access by different applications and users. This generalized form of storage may

(Continued on page 41)

3 TIER WITH AN ODBMS

PRESENTATION LOGIC ON PC/T1/E1/HUB

RECONFIGURABLE HUB



Figure 11

If
you could print
what you can
imagine
you
imagine
what you could print?

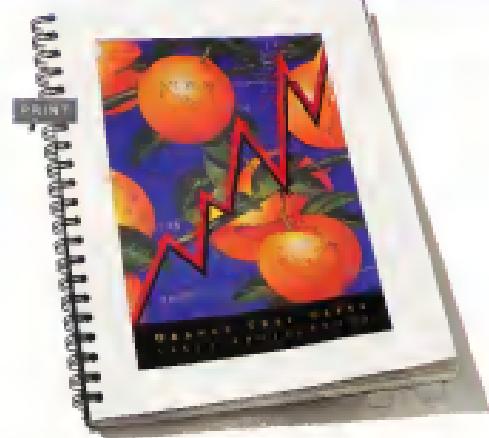


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(Continued from page 58)

process read/write (performance wise) for the needs of my own particular application. An ODBMS can be used to retrieve the data from the common store, assimilate it for efficient usage by your application and provide a persistent store for the data as long as your application might need it. Since extended data types like video or voice are not typically supported by today's RDBMS, these data types might also be stored in the ODBMS which could then associate the appropriate multimedia data with the data retrieved from the RDBMS. Figure 5 illustrates this approach.

MESSAGE BASED CLIENT/SERVER

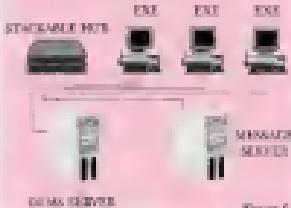


Figure 4

3-Tier With a Messaging Server

Messaging provides yet another technology to implement 3-tier computing. It's available today from companies such as IBM, DEC, Sybase and Oracle. A messaging server acts in the same way as a TP monitor by providing a front-end process. And, like a TP monitor, a messaging server provides connectivity to data sources other than RDBMS. The messages themselves have many characteristics in common with distributed objects. Messages are processed asynchronously with the appropriate priority level. The result is better utilization of resources with no ability to support more clients than synchronous processing would provide.

Messaging systems are designed for business. By using store and forward logic, they provide message delivery that is round failure. They also provide independence from the existing technologies such as serial or wireless or protocols. Because messaging systems support an emerging wireless infrastructure they should become popular for supporting mobile and geographically connected workers.

A typical message server architecture would look like Figure 6, which, of course, looks just like the other 3-tier approaches we've already outlined. If you're anything like me, what for the arrival of distributed object technologies to build your application you can con-

struct a reasonable clone using the messaging approaches that are now available. When distributed objects are a reality, you can integrate your application, if that seems like the best move.

Distributed Components & the 3-Tier Architecture

The image is to distributed object computing and components. The emergence of an industry for component based software is absolutely dependent on the prior emergence of industry standards for interchangeable parts. For components to be assembled like interlocking toys, they are going to have to snap up in terms of connectors. Translated, that means that all vendors who want to create software components are going to have to agree on the software object bus. There are only two real candidates for such a standard backbone: Microsoft's OLE and OMG's (Object Management Group) and CII's (Component Integration Laboratory) implementations on CORBA and OpenDoc. It isn't the purpose of this article to explore this issue, but it

ORB-BASED ARCHITECTURE PRESENTATION LAYER

STORABLE MTS



DATA BASE
OBJECTS



BUSINESS LOGIC
OBJECTS



Figure 2

can be imagined that not enough of either network OLE or CORBA technology is currently available for ordinary mortals to build with. By 1993, however, it's probable that both will be available and that they will be manageable through initiatives of OBI.

Client/server architecture in the distributed component world should thus look something like Figure 7.

(Continued on page 40)

Byte Magazine's "The Eurocom 9600 Computer 40 MHz Pentium processor in chassis, affordable notebook," June 1993	
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(Continued from page 41)

The distributed object implementation of client/server computing is going to change the way applications are built. There should be some very interesting advantages to observe. For one, if we needed fault tolerant computing we could implement copies of objects onto multiple servers. That way if any were down, it would be possible to go to another site for service. With distributed objects being self-contained and executable (all data and procedures present) it will be possible for a systems administrator to tune the performance of the network by moving those objects from overloaded hardware to underutilized computers. This approach is called tuning through "drag and drop", referring to the metaphor the administrator uses on a workstation to move the components. (This technology is available today in tools from Dynamic Technologies and Fores Software).

Data Warehouse & 3-Tier

A 3-tier architecture is also useful for data mining or warehouse types of applications. These applications are characterized by unstructured browsing of historical data. The databases supporting this type of application can sometimes be huge (up to a few terabytes - 10,000+ bytes) and have to be structured properly for adequate performance (a few second turnaround).

Data mining and decision support applications typically need response times of a few seconds. If the system can't provide that kind of performance, the thought process of the human analyst is disrupted and the overall purpose of the system is failed. A production database established for end-user users won't typically in a form that supports ad-hoc inquiries. The approach to support this browsing is then to make data copies available for that browsing and to organize those copies in the best supporting fashion. This typically means that the data is denormalized, summarized and stored in a multidimensional table - all of which is very non-relational. IT systems and operations managers usually don't want access to these tables to be on the mainframe. Unpredictable performance from ad-hoc browsing can have a nasty impact on production OLAP systems that require predictable response times.

For cost management, security and other reasons, it makes sense to load this data copy on its own server, rather than leaving it on the mainframe. Given this server is called OLAP - on-line analytical processor. In other circumstances this server can be a symmetric or massively parallel processor running an RDBMS. There is an industry debate going over whether OLAP storage or RDBMS storage is the best for



this purpose! Since the OLAP server is typically a UNIX or PC based technology, the MIPS costs are much lower than the same cycles executed on a mainframe. Figure 8 illustrates this approach. (The graphic for mainframe is a little different, of course, but the reader has probably noticed that nothing has really changed architecturally from any of the other multi-tier approaches already discussed!).

By now the point is made Client/server architectures are flexible and modular. They can be changed, added to and evolved in many ways. All of the above described 3-tier approaches could be mixed and matched in various combinational sequences to satisfy almost any computing need.

3-Tier and the Internet

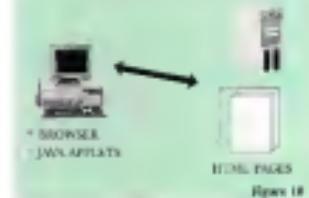
Of course, we haven't seen the last of innovative ideas in multi or 3-tier architectures. Client/server is emerging as the dominant computing paradigm of the 1990's. The recent blather about Java, the Internet, Intranet's and such is, of course, simply about another man-



festation of client/server computing. Much of this publicity has been passed by companies such as Sun and Oracle, who see Internet-based client/server as an emerging market that Microsoft doesn't dominate and (therefore) they can influence.

In the remainder of this article we'll explore a little about how access to the Internet adds richness and alternatives to client/server computing. One way to think about the Internet is as a large public TCP/IP network based on packet switching technology. Access to this network is through a server(s) that converts your LAN's protocol into TCP/IP and arranges for proper billing for the services you use. Your Internet access gateway might run a firewall or other security services also. The ultimate potential, of course, of the Internet is that as the security and capacity issues become resolved, a whole communications services that are much (order of magnitude) cheaper than private networks. By the time you read this, there will be products (e.g. HotSockets from Exodus, Shoreview, Minn, 612/638-0272) that offer OLTP access over the Internet. This makes it very easy to use the Internet as your company's WAN. Of course, you're going to be competing for bandwidth with Joe College as he transmits photos from the homecoming party to his high school buddies. Whether or not and how fast issues such as predictable performance are resolved is not the point of this article. Here we will just discuss applications that might be built for the Internet.

3-Tier Web Applications



The applications that are available now are typified by the technology presented in Figure 10. This might be characterized as a new form of electronic publishing, but it's richer in some ways than books because it's multimedia publishing. Today most home pages consist of text, photos and graphics. By the time 1996 ends, however, it's likely that animation and 3D applications will be available. Real-time video downloads off the Internet are another technology that has been frequently discussed.

Even with MPBG data compression, the bandwidth requirements are still much beyond what appears to be widely available in the 1996/7 timeframe. "Quality of service" refers to an ability to guarantee enough bandwidth by reserving capacity ahead of time. We'll see how quickly this becomes reality.

(Continued on page 64)

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(Continued from page 42)

First generation web applications are quickly going to be joined by newer more flexible environments that perhaps we can call the second generation. Two things will define this newer generation - 1) support for active clients via down-loadable applets, and 2) live DBMS links that enable the server to know who you are from page to page and react to visit. These newer types of applications will soon (maybe by the time you're reading this) become enabled to distributed applets that have been implemented in languages like Sun's Java or

Microsoft's OLE/Visual Basic. Sun describes its HotJava browser/client language technology as "simple object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high performance, multithreaded and dynamic". The way this will work is for your browser on the client to have a Java or VB interpreter that can activate a component that has been downloaded to your client from the Web server. Your browser becomes even cleverer then, and can exhibit various types of behavior. This browser/interpreter engine, of course, will enforce security for your client and make sure that any downloaded applets don't behave in a malicious fashion.

The addition of DBMS capabilities to the HTML processes on the server will allow HTML servers to have memory. Right now when you're browsing a Web page it shows you static views of material that was designed before you showed up. Your connection to that site is "stateless". This means that the server has no memory of who/what you are and what you've requested before. As the leading DBMS vendors add connections for Web servers, it becomes possible for that server to remember who you are and what you've done from page to page and from

visit to visit. The internet, then, becomes a lot more intelligent and useful.

3-Tier and the Future

The Internet is a very new area of technology, but I don't think it fundamentally changes anything as far as client/server architectures are concerned. Client/server still remains the only and best architecture for taking advantage of the Internet and other new technologies that come along. We'll have to add "changes in client/server computing" to death and taxes in our inevitable list. But, regardless of what comes, client/server computing is likely to remain the underpinning for more computing developments we'll see over the next decade. □

Dr. George Schaeufel is the Chairman of Software & ClientServer World April 10-12, 1996 at the Metro Toronto Convention Centre. In Dr. Schaeufel's keynote address he will be reviewing the most exciting new technologies in Client/Server computing. For more information on Dr. Schaeufel's appearance at Software World & ClientServer World please call DCI at 509-470-4770. Other articles by Dr. Schaeufel can be viewed on the Web at <http://dciswpc.com/>

Figure 10



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<input type="checkbox"/> Manufacturers	<input type="checkbox"/> Other: _____

5. My job function can best be described as:

<input type="checkbox"/> President	<input type="checkbox"/> Vice president
<input type="checkbox"/> General Manager	<input type="checkbox"/> Store manager
<input type="checkbox"/> Purchasing manager	<input type="checkbox"/> Financial manager
<input type="checkbox"/> Marketing manager	<input type="checkbox"/> Other: _____

Signature: _____ Date: _____

**Now fax the form directly to the advertiser.
You'll have all the information you want, in no time.**

PEOPLE

New CEO for Globelis

Globelis Corp announced that Mr Shafir has resigned as President and Co-Chief Executive Officer of Globelis. Geoffrey Morris, currently the Co-Chief Executive Officer of Globelis, will become the sole CEO.

Nir Shafir, who has been living in Israel, advised the Board that he would not be in a position to devote the necessary time to the affairs of Globelis required as a senior officer. Mr Shafir believes that, with the depth of management now in place at Globelis, his presence on a full-time basis was no longer required for the Company to grow and prosper. Mr Shafir remains a significant shareholder of Globelis and intends to remain as a director. Mr

Shafir has agreed to accept the position of Honorary Chairman of Globelis and to perform consulting services on behalf of Globelis.

Novell Canada does management reorganization

Novell Canada announced an organizational restructuring to meet the challenges of the Canadian market. Don Chapman, VP and GM of Novell Canada Ltd., made the following appointment:

Michael O'Brien, formerly director of marketing, has been appointed to the new position of national marketing manager. O'Brien will oversee the development and implementation of the Customer Executive Program.

Thomas Rhodes, formerly director of sales, assumes the position of director of marketing. Rhodes will oversee all advertising, public relations and sales support initiatives.

Jerry Sutera, formerly general regional sales manager, has been appointed channel sales manager for Canada. Sutera will leverage Novell's channel program to enhance the capabilities of Canadian partners.

David Toms, formerly area manager - major market sales, has been appointed major market sales manager for Canada. Toms will develop and manage a national level account strategy including government, commercial and private sector accounts, OEM partnership and licensing.

NEW BUSINESS

Canton Electronics opens Richmond, BC office

Canton Electronics announced the opening of a new Canadian sales office in Richmond, BC. Canton's office will provide sales and support of memory products to the OEM, government, distribution and reseller channels. Contact (604) 274-5887.

TTX opens office in Richmond, BC

TTX Canada Inc announced the addition of a full stocking distribution and sales centre in Richmond, BC that now gives TTX coast to coast coverage. Contact (604) 274-3255.

Digital offers Internet Services roadmap

Digital Equipment of Canada announced its Internet Services Roadmap, a set of Internet services designed to provide business users and service providers with every level of service and support required to operate effectively and securely on the Internet.

This includes consulting, security, listing, support services, system migration services to help customers plan business applications and develop or integrate solutions related to the Internet, network services to assist customers to establish the network infrastructure required for Internet access, and networking services for those who do not want to manage Internet-related services in-house.



The Western Canada Computer Distributors Society held its first annual meeting where they selected a new board of directors. (l to r) Charles Lam from Supercorp, Roger Up from Comtronics Computer Components, Johnny Lang from Futuretronics, Harry Liang from Interim Marketing, Thomas Fung from Sales Systems, Bill Wong from STO Computer, Gary Brooks from Globelis, Simon Cho from TPM, Ivan Lee from Golden Dragon, David Kow from Loxon Group and John Czerw from Computer Technologies.

PRODUCTS

Digital's RAID up performance by 67%

Digital Equipment of Canada announced a 67% performance boost to the StorageWorks RAID Array 440, making it the fastest and most reliable RAID subsystem available for multiprocessor environments. Through enhanced Version 3.7 drivers, the RAID Array 440 performance has been increased to 4,250 IOPS with a single controller configuration. The system is compatible with HPUX, IRIX/IRIX Sun Solaris and SGI environments. Support for Windows NT is slated for Q395.

Epson Personal Document Station for the Mac and PC

The Epson Personal Document Station (PDS) includes a complete file management suite that also contains full optical character

recognition (OCR) software package, scan to fax and scan to e-mail capabilities. It also uses Epson's Text Enhancement Technology and Auto-Area Segmentation for the most accurate OCR and image area recognition. The PDS is an 8-bit grayscale scanner with 300 dpi optical resolution. It comes with Second Glass Software's e-Paper, a full document archive and management suite; e-Paper contains single-click document processing and automatic paper detection.

PDS version has Business Card Reader and Photo Frame included. The Business card reader scans an business card while Photo Frame lets you scan in forms and fill them out for faxing.

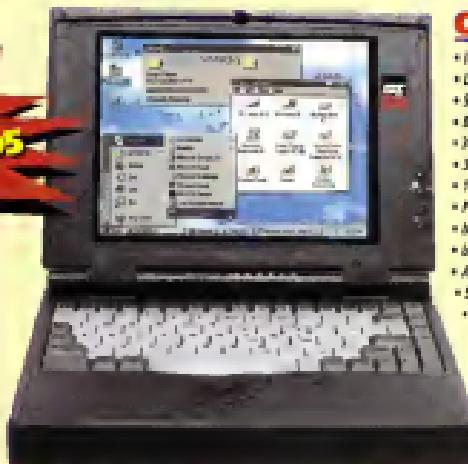
SRP \$600 for Mac version, \$449 for PC version.

The ultimate mobile power machine...

Now shipping
Windows 95
pre-loaded



**\$10 MEGABYTE
HARD DRIVE
OPTION AVAILABLE**



OpenNote • \$575

- Intel 75MHz Pentium processor
- LCD dual view COLOUR screen
- Simultaneous LCD & CRT display
- IBM A4M up to 40MHz on board
- 30MB hard drive (310, 370MB or 1.4GB option)
- 3.5" high density floppy drive
- MMX local bus video
- PCMCIA type II and III slots
- Built-in track stick pointing device
- built-in 16-bit sound card
- Adapter ATC-6360 fast SCSI controller
- Serial & parallel ports, SCSI port
- external keyboard and monitor ports
- rechargeable NiMH battery, AC adapter
- Speaker & microphone ports
- carrying bag, car cigarette cable
- Windows 95 pre-loaded
- Warranty: 2 year parts, 2 year labour

\$2,699

Suggested list price

It's no surprise that Canada's leader in value priced desktop computers is introducing the country's first affordable colour notebook with a Pentium processor. What's surprising is the extreme power and functionality that's packed into the new IPC OpenNote!

Powered by a 73 or 100MHz Pentium processor, the OpenNote has all the mobile features you're looking for - PCMCIA slot, a built-in 16-bit audio system, local bus video - plus room for 60 meg of RAM.

More importantly, the OpenNote is a comfortable fit anywhere you take it. The rechargeable battery with an AC adapter, plus the built-in palm rest and two button track stick will keep you happily notebooking a whole lot longer.

And the OpenNote has ports and connectors to plug in everywhere. Add a keyboard or a monitor, or plug in up to seven SCSI devices - the OpenNote is an incredibly versatile computer!

To become an authorized IPC OpenNote reseller, contact your

OpenNote • \$100

+10 above with
local Absentee American processor

\$2,899

Suggested list price



Take the power of an all-new PC
OpenNote with you everywhere!

PCMCIA card options

Suggested list price	
PCMCIA 3.5" 1.4GB local bus card	\$100
PCMCIA 3.5" 370MB local bus card	\$100
PCMCIA 3.5" 310MB local bus card	\$100

IPC
**NOTEBOOK
COMPUTERS**

and Personal Computer are trademarks of Compaq Inc. 100 MHz processor = 100 million cycles per second. © 1995 Compaq Computer Corporation, U.S.P. 1995. Price: \$2,699. Taxes, \$12.43-\$40.00. The OpenNote 200 and 250 are based on the Intel 486 processor. The OpenNote 100 is based on the Intel 386 processor. All prices are in Canadian Dollars. Prices do not include shipping and handling. Prices are subject to change without notice. Prices are subject to change without notice. Prices are subject to change without notice.

Sourcing Directory

February 1996

Acer Canada Ltd.

5215 Sprague Hwy, Suite B, Mississauga, Ont. L4W 2A1
Tel: (905) 628-0011 Fax: (905) 629-7799

Personalized servers and workstations, color notebooks and multimedia personal computers are the focal point of Acer America's hardware products.

Abel Canada

5900 Guelph St., Unit 8, Mississauga, Ont. L4J 2B9
Tel: (905) 665-2056 Fax: (905) 665-7033

Access 8 Inc.

29 Bentinck St., Building C, Etobicoke, Ont. M3J 4L4
Tel: (416) 668-3425 Fax: (416) 668-9617 Toll-Free: 1-800-668-3162

Access 8 is an importer/distributor of computer accessories and peripherals. The product line of over 600 products include cables, conversion adapters, audio, data I/O boards, tools, and multimedia products.

ACP Marketing Inc.

8030 177th Street, Mississauga, Ont. L4V 2C9
Tel: (905) 239-2612 Fax: (905) 239-1201

Toll-Free: 1-800-347-2321

A distributor of computer accessories, disk drives, power supplies, interface cards, parts, printers, scanners, filters, disk drives, cleaners. Wholesale and retail services only.

ADAM Peripherals Inc.

205 Blvd Royal, Box 3, Markham, Ont. L3R 4P3
Tel: (905) 473-7377 x 305 Fax: (905) 473-2387

Internet: adams@juno.ca

Approximately 800 different products from thirty vendors are distributed through ADAM's warehouse and sales office located in Markham, Ontario.

ADH Systems Inc.

2113 Kingwood Ave., New Jork, NY 10033
Tel: (212) 941-0036

ADH is marketing new digital consumer products. CD-RIM drives and 16-bit PCI graphic accelerators and 16-bit video sound cards.

Adobe Systems

355 Mission St., San Jose, CA 95111
Tel: (408) 979-0177 Fax: (408) 979-7272

The graphics producer produces for desktop publishing, graphic design, illustration, photoediting, digital video editing, and type.

Advance Integrations Research (Canada)

7333 100th Street, Suite 100, Mississauga, Ont. L4J 1B5
Tel: (905) 668-0000 Fax: (905) 668-0322

AIT is a manufacturer of high performance Multibaud serial 300-2400 and Parallel or Virtex interface boards for IBM, EISA, PC, and NE series architectures. IBM/PC/AT/XT/386, Novell integration, OEM's, routers, VME & clusters.

Advence Interacting MultiMedia

1010 18th St., Burnaby, BC V5C 1G6
Tel: (604) 527-0000 Fax: (604) 527-6463

AIM is a reseller of computer products and software at both retail and wholesale levels. Also available are on-site networking services, training programs, multimedia projects

management & development, in a free company locator or computer with user defined filtering capability, service & dependency lists.

Advance Interface Electronic Inc.

38 Belmont Ave., Mississauga, Ont. L4M 4T7
Tel: (905) 479-1043 Fax: (905) 479-0356

A PC automation specialist of PC, printer, notebook and peripheral. Leading products lines include: SuperMicro computers, ThinClients, Displays, monitors and Panasonic optical storage products.

Researcher

Advanced, 6 C. St., (905) 270-5762 Fax: (905) 270-4759

Advanced Model Computer

23 Belmont Crescent, Unit C, Mississauga, Ont. L4M 4T8
Tel: (905) 945-5040 Fax: (905) 945-5042

Toll-Free: (800) 269-2724

An international manufacturer of peripheral cards, power supplies and keyboards and a Canadian distributor of a variety of imported computer parts.

Agile Division

1400 17th Street, Redwood City, Calif. 94069-2666
Tel: (415) 592-5371 ext. 4032 Fax: (415) 591-2409

Agile is a leading worldwide manufacturer of imaging products and systems. Through its Graphix Systems Inc. group, Agile markets a range of electronic and photographic products ranging from scanners and supplies to equipment in the graphic arts printing and publishing industries. Products include a wide range of desktop scanners for home, office, publishing and graphics applications, digital cameras, and the DataDirect digital poster. Some of Agile's leading desktop scanners are also marketed by the new Autodesk Inc. and the members of the Autodesk Group.

Altion Inc.

250 Leslie St., Unit 5-1, Markham, Ont. L3R 4P7
Tel: (905) 477-1701

Altion is featuring ATI video controllers, motherboards, and communication products. New VGA monitor ports have been added and are available in a variety of models with ATI memory accelerators.

Amstar

37 Ley Green Street, Suite 300, Mississauga, Ont. L4Z 2C5
Tel: (905) 629-5665 Fax: (905) 629-6338

Amstar is a global provider of quality products and services to the networking and Internet networking market place.

ANQ Office Automation

180 First St., 2nd Fl., Brampton, Ont.
Tel: (905) 451-8000 Fax: (905) 454-8556

An office automation leader based in Brampton, ON. ANQ has up-to-date personal computer repair services in key metropolitan locations around the country. Each computer center is a turn-key operation selling used, new, and reconditioned solutions.

Artissoft Inc.

10-Glenora Court, Unit 190, Etobicoke, Ont. M3J 9G2
Tel: (416) 273-8888 Fax: (416) 273-8882

LANentric from Artissoft is the most affordable and easy networking solution for small and growing businesses.

Asia-Link Computer Int.

241 New Holland St., Unit 13, Richmond Hill, Ont. L4B 1A1
Tel: (905) 731-1988 Fax: (905) 731-0433

Toll-Free: (800) 463-0079

A distributor of computer components and peripherals. Also custom-build systems to specific configurations.

AST Computer Inc.

235 Bloorview Blvd., Mississauga, Ont. L4Y 3C7
Tel: (905) 362-0278 Fax: (905) 362-0286

Distributes monitors, and servers in full line of high performance desktop, server and notebook computers through distribution and direct dealers across Canada.

AVS Technologies Inc.

2190 North Central Pkwy., South Bend, Indiana, 46619-2919
Tel: (316) 231-2121 Fax: (316) 231-1387

A California computer electronics supplier selling to retailers, distributors and wholesalers. Serving the computer industry, AVS distributes TDK Data Storage Media products including CD-R, MD, Smart Phone, ZIP, Double-Density 3.5" floppy disks and Ethernet cards. For more information contact AVS' AVS offices.

Banyan Systems Inc.

2035 North Melville Hwy., So. Mississauga, Ont. L4J 2K6
Tel: (905) 471-1971 Fax: (905) 479-3894

A standard line of peer Networking Servers (SN300), messaging and Web server management software solutions through offices:

Mississauga, Ont. L4J 2K6 Tel: (905) 479-3101 Fax: (905) 479-3102
Montreal, Que. H3Z 1M1 Tel: (514) 425-3101 Fax: (514) 425-3102
Vancouver, B.C. V6E 2L2 Tel: (604) 560-0000 Fax: (604) 560-0000

Battery Network B.H. (Canada) Inc.

230 Peter DeGraw, DeForest, Quabbin, ONT 2N1
Tel: (314) 671-0366/900-411-1020 Fax: (314) 671-0363

Battery Network is a distributor of rechargeable replacement battery for Laptop/notebook, cases for desktop, desktop for UPS's and tape drives. We can also arrange for custom assembly of laptop parts in one of our Canadian manufacturers.

Beavoscope Electronic Entertainment

37 Jameson Crescent, Brampton, Ont. L6X 1E5
Tel: (905) 421-0000 Fax: (905) 421-5733

Beavoscope is an informal division of an software and hardware products for the small office/home office market. These products include value packed educational soft-

To be included in the Canadian Computer Wholesaler (CCW) Sourcing Directory, please fax your company name, address, phone number, fax number and company profile to:

CCW Sourcing Directory

Fax: (647) 739-3859

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Gibson, Gerd Tel (416) 739-0773 Fax (416) 739-0790
Richmond, B.C. Tel (604) 279-4110 Fax (604) 279-4112

Goldstar Canada

3300 People's Court, Mississauga, Ont L5T 2A4
Tel (905) 675-0138 Fax (905) 675-2539

A manufacturer of computer products, including monitors, fax machines and CD-ROMs.

Broadsoft

Transwest E.C. Tel (403) 479-3359 Fax (403) 479-8359

Group 1 Software

1750 Dundas Street, Suite 710, Oakville, Ont L6K 1P7
Tel (905) 669-1253

A developer of real management and marketing software.

Hall-Mark Computer Products

120 Superior Avenue East, Mississauga, Ont L5L 2L1
Tel (905) 661-2567 Fax (905) 661-1884

A manufacturer of computer systems and computer products department. Hall-Mark carries leading computer parts, logic boards, such as Digital Equipment, Hercules, Hewlett-Packard and DEC, as well as main storage, networking, cache memory and peripheral products.

Hewlett-Packard Canada Ltd.

1310 Lawrence Hwy, Mississauga, ON L6W 3G1
Tel (905) 266-4323 Fax (905) 266-4729

Toronto, Ont Tel (905) 495-4850

A manufacturer of 13,000 products including workstations, mini-computers, peripherals, PCs, peripherals, calculators, medical monitoring, diagnostic and logging systems.

Hewlett Packard Corp.

100 Adams Blvd., Mountain View, Calif L37 250

Tel (408) 730-9000 Fax (408) 730-5000

An international manufacturer/distributor of high-quality PC computers, monitors and peripherals and only through dealers - not direct. Leasing is available.

Broadsoft

Richmond, B.C. Tel (604) 279-4110 Fax (604) 279-4112

Hitachi (Canada) Ltd.

4700 Campbell Rd., Mississauga, Ont L5V 2E8

Tel (905) 674-4199 Fax (905) 674-6494

The company provides solutions to a range of problems manufactured by its Tokyo-based parent company Hitachi Ltd. Products include colour monitors, hard disk drives, optical disks, optical scanners, CD ROMs and semiconductor memory devices.

Hyper Condition Enterprises Ltd.

240 JMW Avenue, Richmond, B.C. V6V 1Z3

Tel (604) 279-9418 Fax (604) 279-3859

A manufacturer/supplier of floppy disks. Current leads 3.5-inch and 5.25-inch diskettes, high density products for duplication use and ANSI products refer to bulk packs or in boxes of 10.

IBM Canada Ltd.

1000 Lakeside Drive, Mississauga, Ont L5L 8E7

Fax (905) 661-1704

Manufactures hardware from PCs to mainframes, software from operating systems to application solutions.

Impact Technology Inc.

5500 East Broadway, Vancouver, B.C. V5M 3V9

Tel (604) 261-4400 Fax (604) 263-5259 Tlx/Fax 1-800-463-0272

Distributor of notebook PCs, workstations and desktop peripherals and software. Impact covers all of Canada with

solid-free phone service and next day delivery on request. Hardware lists include Pentium and 486/386/300 MHz laptop PCs, PCMCIA and parallel port add-in cards, keyboard, CD-ROM, scanner tape (borclop), hard drives, floppy drives (3.5" and 5.25"), magnetics, Modem/Video/Audio Capture, Networking, Printer Sharing, CPU Screening, Fax/Wireless and Voice, Fax, modems.

Ingram Micro Inc. (Canada)

256 Bloor Street West, Toronto, Ont M5S 2Z2
Tel (416) 595-1000 Fax (416) 594-1496

Canadian microcomputer distributor that markets and distributes more than 10,000 products from more than half of the world's top hardware manufacturers and software publishers. Ingram Micro Inc. (Canada) is a subsidiary of Ingram Micro Inc.

Broadsoft

Markham, Ont Tel (905) 439-0035 Fax (905) 439-2174

Ottawa, Ont Tel (613) 228-3340 Fax (613) 228-1307

Guelph, Ont Tel (519) 825-6321 Fax (519) 825-6349

Vancouver, B.C. Tel (604) 479-8377 Fax (604) 530-0359

Internet Gateway

Tel (416) 479-0200

1600 site <http://www.intergate.com>

A online Internet service provider

IPC Personal Computers

(CD Microcomputers)

256 Bloor Street West, B. Montreal, QC H3A 1B3
Tel (514) 479-0222 Fax (514) 479-2000

SD Micro is featuring its IPC PC compatibles running with Intel 486 and Pentium processors featuring multimedia modules with Windows 95. All multimedia systems include quad-speed CD-ROM (Toshiba), sound cards, 14.15 inch color flat screens and a collection of Microsoft software. All Pentium systems include PCI

bus with standard 16-bit ISA/PCI. The operation is full credit-card and loan passed via Microsoft Hardware Compatibility List for Windows 95.

Jata Systems Inc.

800 Queen Street West, Toronto, Ont L1R 7T3

Tel (416) 595-5100 Fax (416) 595-6000

A manufacturer and distributor computer systems, peripherals and components.

Kao Infosystems Canada Inc.

2000 Yonge St., Suite 400, Toronto, Ont M3J 1M2

Tel (416) 490-7070 Fax (416) 492-2888

A provider of plastic surface manufacturing and distribution services including CD-ROM and custom depth laser replication.

Broadsoft

Markham, Ont Tel (905) 499-0596 Fax (905) 499-0597

Toronto, Ont Tel (416) 479-8377 Fax (416) 479-8378

KIB Electronics Inc.

7330 Warden Ave., Zeta P. Brampton, Ont L6R 1H2

Tel (905) 464-9533 Fax (905) 464-9535

A manufacturer of computer monitors and CPUs.

Kodak Canada Inc.

2500 Argentia Road, Mississauga, Ont L5J 1H2

Tel (416) 294-4213 Fax (416) 294-4209

Manufacturer of photographic products and supplier of industrial and digital imaging products and services for consumer, professional, business, science, government and health care applications.

Lensmark Computer Exhibitions, Inc.

14 Multi-Concept, Holliston Landing, ON L3N 1E7

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Toll Free : 1-800-818-6944

SOURCING DIRECTORY



Lepro Marketing

594-3777 Jannah Blvd., Mississauga, ON L4V 2N2
Tel: (905) 244-2299 Fax: (905) 244-7796
A distributor of computer products. Special interests include: notebooks, monitors, mice, flat-panel monitors and scanners. Distributes Japanese electronic following popular Asian names. Best known: CLEVO, Labo, Allstar, GIGA, Logic, Ralink, software, memory, keyboard, mouse, monitor, laptop, scanner, GIGA-VISION, Dream, Fujitsu, BenQ, Digital, Software, NEC, Opti, Evermax, etc.

LCH Resources Inc.

89-12311 Century Place, Burnaby, BC
Tel: (604) 528-6200 Fax: (604) 528-6200
A computer distributor of microchips, video cards, video speakers, keyboards, etc.

Linkmark Canada Inc.

10700 8th Ave. Unit 12, Mississauga, ON L4W 0S2
Tel: (905) 627-7241 Fax: (905) 627-7249
Toll-Free: (800) 563-2602

Linkmark's network line providers, the Optera series feature: Workstations, as well as networking, the Networking Editing Assistant Protocol (NEAP) for distributed environment management with a priority on LAN.

Logitech Canada, Inc.

5200 10th St. S.E., Calgary, AB T2G 0E5
Tel: (403) 273-8000 Fax: (403) 223-2989
A manufacturer and distributor of computer peripherals.

Loneon Group

45-3317 Flora Dr., Richmond, BC V6L 2P7
Tel: (604) 273-4600 Fax: (604) 223-2989
A national distributor of high quality audio/thermostats and car audio and computer monitors.

Middle Enterprise Ltd.

4100-1260 10th Ave. NW, Edmonton, AB T5J 3Y9
Tel: (403) 268-2760 Fax: (403) 250-2599
A distributor of electronic supplies. Retail in the retail, U.S. and U.K. price ranges. Selling key brands: Cisco, 3Com, power supplies, logic, SCSI, IDE, SCSI, media drives, 3.5" and 5.25" cases, SCSI, IDE, IDE removable media and accessories.

Metrox Graphics Inc.

1027 1/2 Bay St., Kitchener, ON N2B 2A4
Tel: (519) 865-2600 Fax: (519) 865-2607
A graphics card designer and board manufacturer.

Mitsubishi Electric of Canada (Panasonic)

1070 10th St., Mississauga, ON L4V 2T1
Tel: (905) 299-2000 Fax: (905) 299-2047
A distributor of computer products, peripherals and accessories suitable for personal, home, office, business, computer or general use.

Monochrome

Logan Ave., Tel: (403) 291-1112 Fax: (403) 291-1101
Released: B.C. Tel: (604) 223-2222 Fax: (604) 223-2257
Montreal, QC Tel: (514) 431-1500 Fax: (514) 431-1500

Mosell Canada

171 Stephen Dr., Kamloops, BC V1K 3R2
Tel: (604) 964-9047 Fax: (604) 964-9047
Mosell Canada is the Canadian branch of Mosell Prod. Inc. located in North America. Distributes: desktop, open bus, GIGA and laptop compatible, videodisks as well as accessories such as disk and video tape and interface boards.
Released: Mon. Tel: (514) 475-4727 Fax: (514) 475-4709
Montreal, QC Tel: (514) 475-7799 Fax: (514) 475-2953

Megahertz

A Division of U.S. Industries
3429 N. State St., Chicago, IL 606-172-ACT
Tel: (800) 386-7980 Fax: (312) 736-7980
Megahertz is a direct manufacturer/distributor for mobile computer products.

Merkman Computer Corp.

281 Pleasant Dr., Madison, WI 537-017
Tel: (608) 233-1907 Fax: (608) 233-4995

A national distributor of hardware and software products plus value added solutions for more than 14 years. A source for networking, networking, Workstation, Unix, PC, notebooks, diskdrives, mass storage, workstation products and more.

Microsoft after

Richmond, BC Tel: (604) 232-1111 Fax: (604) 232-1111

Mentek Systems Corp.

6975 108th St., Burnaby, BC V5A 1B2
Tel: (604) 540-1116 Fax: (604) 540-3220

A national distributor of networking products, computer systems, UPS, mother boards, harddrives and cases. Also carries parts of value added. Mentek is the reseller for source for the Netgear 566 processor in Canada.

Merisel Canada

2000 Dundas Street East, Etobicoke, ON M9W 1Z9

Tel: (416) 285-7012 Fax: (416) 286-2803

A distributor of computer products, distributing more than 10,000 products from 400 hardware and software publishers in over 100,000 Canadian resellers.

Meritron

91 Jarrow St., Tel: (514) 245-1111 Fax: (514) 245-1116
Released: B.C. Tel: (604) 233-2447 Fax: (604) 233-2447

Micrograts

3107 10th Street, Suite 100, Mississauga, ON L3M 2H4
Tel: (416) 233-6641 Fax: (416) 233-6123

A national developer of graphics application software products which it markets worldwide.

MIDAS Technology Inc.

3327 Brooks Blvd., Mississauga, B.C. V9V 2B9
Tel: (416) 216-2800 Fax: (416) 216-2802

A computer disk driver for Cromemco's multicomputer, 386C, Windows 3.1, DOS/Windows, case rated hard CD-ROM, TGA cards. Distributor distributor in Mexico, Canada.

MicroFlight Technology Inc.

1000 Boundary Blvd., 2nd Floor, Vancouver, B.C. V5J 3P2
Tel: (604) 279-9465 Fax: (604) 279-1381

MicroFlight Technology produces portable data products that connect to either an IBM parallel port or a Macintosh port.

Mintronics Office Automation

109-3100 Jarrow Blvd., Richmond, B.C.
Tel: (604) 275-4333 Fax: (604) 275-0267

An international distributor and service centre for Panasonic and Sharp products. Their core products include the fast full line of real TCDRAM color (CRT) monitors.

Mite Computer Supplies Co.

41 Steele Court, T3, Mississauga, ON L4V 6A5
Tel: (905) 964-6998 Fax: (905) 964-6749

E-Mail: info@mitecomputer.com

A national distributor of computer workstation products and accessories. Brand names include Microflight, A4, etc.

Mitsubishi Electric Sales Canada Inc.

Information Networks Group

4799 48th Ave. Station, DR L4M 1G7
Tel: (800) 665-0079 Fax: (800) 665-6138

Mitsubishi is distributing cost-effective high-resolution monitors from 15 to 42 inches.

Motion Works Corp.

3030 Maryland St., Suite 100, Vancouver, B.C. V6H 2M1
Tel: (604) 567-1116 Fax: (604) 567-3220

A developer and distributor of CD-ROM titles, digital restoration and a family of replicators and archiving tools in error correction, media cleaners, the ultimate high-reliability enterprise servers, and dual interface systems.

Micromedia Effects Inc.

60 Wright Drive, Suite 200, North York, ON M3J 1Q3
Tel: (416) 494-2329 Fax: (416) 494-9999

Toll-Free: (800) 367-5634

A national sales marketing and value-added distributor of high-performance, visual storage systems from Planar, Micra, the world leader in optical storage technology. Optimal storage systems include the 40GB 8.4GB-1000 recordable CD system and MO drives ranging from the Portable 350MB Token to the 1 Terabyte Grand Token optical library system. Optimal solutions for CD mastering/premastering, desktop publishing, graphic imaging, archiving, digital video/telco and commercial applications. Call toll-free at 1-800-367-5634.

Multimedia Solutions Inc.

1000 140th St., 2nd Fl., Surrey, Alberta, T5J 1H7
Tel: (604) 233-9641 Fax: (604) 233-7717

Multimedia Solutions Inc. offers many products including software development, multimedia, LD-ROM, encoding, analog-to-SVHS digital video formats (e.g. MPEG, JPEG, etc.), networking, digital rates over LANs and WANs, creating interactive systems, presentation for education and training tools, as well as selling and supporting a variety of multimedia hardware products.

National Computer Products

100-1120 30th Street, Edmonton, AB T5J 3X3
Tel: (403) 454-2600 Fax: (403) 454-2619

440 10th St., Suite 607-619

National Computer Products since 1982 specializing in high resolution colour monitors, high resolution dot matrix printers, high resolution dot matrix plotters and graphics workstations.

Netgear

Mississauga, ON L4W 1C6 Tel: (905) 270-1998 Fax: (905) 270-0474

Netgear is a leading manufacturer of high performance, reliable, easy-to-use networking equipment.

Netware

Mississauga, ON L4W 1C6 Tel: (905) 270-1998 Fax: (905) 270-0474

Netware is a provider of computer hardware manufacturers. NEC, Compaq, Dell, Acer notebook computers, Maxxim, Microstar, Multisync, Mitsubishi LCD, EIZO monitors, Proxima, digitizers, image displays and Radiant Video.

Markham, Ont. Tel (905) 633-3775 Fax (905) 633-3779
St. Leonard, QC Tel (514) 394-1234 Fax (514) 394-2699
Gatineau, Que. Tel (613) 743-1438

Perle Systems Ltd.

68 Regional Drive, Markham, Ontario L3R 6E9
Tel (905) 673-0883 Fax (905) 473-8896

Perle Systems Ltd. is a manufacturer of communication and connectivity products for IBM® Mainframe systems. Perle Systems specializes in products that make it easy to connect a wide variety of PCs, displays, printers and other devices to IBM® AS/400 systems. Perle supports compatibility with the Tektronix, AS631, Token Ring, Ethernet and X.25. Perle lists products for the AS/400, RJE, Remote Access Services, LAN access,

Philips Electronics Ltd.

802 Miller Road, Brampton, Ont. L6T 1H6
Tel (905) 734-2283 Fax (416) 734-6225

The company is the Electronic Technologies Division of Philips Electronics Ltd., a manufacturer of computer monitors, CD-ROM drives, LCD monitors and Computer Disk International (CDI).

Pinnacle Micro, Inc.

17 Technology Avenue, GA 30046, USA
Tel (404) 266-3000

Pinnacle Micro, a provider of optical storage solutions for data-intensive computing applications, is marketing the DR-3000 recordable CD system. The affordable CD-R system for both Mac and Windows platforms offers CD authoring software and backup utility reliable for authoring, software and backup utility reliable for authoring CDs or archiving server information. Data transfer ranges from 30MBPS to 172. Optical storage solutions facilitate publishing, preparing, imaging, networking, digital audio/video, and commercial end-use needs are also available.

Pioneer Electronics of Canada Inc.

386 Albion Parkway, Markham, Ont. L3R 6P2
Tel (905) 846-7427 Fax (905) 846-7417

Toll-free 1-800-872-2200

Supplier of CD-ROM drives and media, Pioneer CD-ROM drives, audio/video single drive and 300 disc juke boxes, VGM and recordable GMSD products.

Powersoft Systems Ltd.

183-J4487 204th Ave. SW, Calgary, AB T2B 1A8
Tel (403) 262-3399 Fax (403) 262-3399

A developer and distributor of the PowerSoft® payroll software and payroll processing system offers itself as power and ease of use.

Progress Technology Inc.

160-2799 Gresham Road, Richmond, B.C. V6V 1N9
Tel (604) 273-0086 Fax (604) 273-0070 3rd floor, 1405-151-4994

National distributor of TDK brand data storage products, including data, CD-R, data tapes, microfloppy optical disk etc. Importer and distributor of ARIES and Elegit optical generic diskettes in all formats and sizes. Also CR cassette tapestry and service centre has TDK made 1405-1503 brand diskette duplication equipment. Various accessories are also available.

Pro-data

100-1544 Avenue D, Mississauga, Ont. L4J 1E7
Tel (905) 567-3374 Ext. 200 (905) 233-4896
A distributor of IBM, Fujitsu, Acer computer products

Printer Enterprises Company Ltd.

2395 C. Rd. Astoria, Vancouver, B.C. V5M 1C9
Tel (604) 271-3338 Fax (604) 271-4388

A distributor of well designed computer cases, computer peripherials and the largest stock of power supply in B.C.

Protek Microsystems

297 Lakeside, Port Credit, Ontario L4B 1A7
Tel (519) 630-5912 Fax (519) 630-2497

Protek Microsystems, a leading Canadian manufacturer of networking products and peripheral sharing devices.

Provincial Products

307 Hibson Mill, Mississauga, Ont. L4X 2B4
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Fax (905) 669-267-0662 (905) 669-0313

Provides a Scapple, packet-based high-definition video grabber plug into the parallel port of a PC or laptop. Video plug into a composite, YUV or any video input and click 800XP. The grabber captures an image at 1/60th of a second at high 1500x125 resolution in 16-bit millions colours.

Proxel Technology Inc.

2nd Floor 118-3771 Jarrell Street, Burnaby, B.C.
Tel (604) 231-9630 Fax (604) 231-9632

A distributor of Laser notebooks. Proxel carries various keyboards, mice and other peripherals.

Punka Computer Corp.

5000 Park Rd., Unit 200, Markham, Ont. L3R 1J3
Tel (905) 940-9339 Fax (905) 940-9377

A national distributor of TDK 3.5" IDE/SCSI drives, cameras including multimedia SCSI and power supplies.

QDI Computer (Canada)

2140 10th Street, Suite 1, Markham, Ont. L3R 9Y9
Tel (905) 464-9421 Fax (905) 464-9569

Fax (905) 464-9739 Tel (905) 464-9738

A national distributor of computer products

QMS Canada Inc.

2600 Victoria Ave. St. 3, Mississauga, ON L4W 1Z7
Tel (905) 666-0410 Fax (905) 666-0987

QMS Canada provides multimedia basic and colour digitized thermal printers LAN-ready printers A 600 dpi 640x480 Desktop Colour Laser Printer and a Multi-IF interface Device product are highlighted at a reduced price.

Quest Components Inc.

205 Nindus Street, Kitchener, Ont. N2L 4C4
Tel (519) 884-6888 Fax (519) 884-6837

A distributor of computer hardware and peripherals

Radius Inc., Canada

150 The Burlington, Etobicoke, Ont. M3A 1J9
Tel (416) 777-5907 Fax (416) 777-5951

This company delivers automated system performance analysis programs and digital video to the publishing, graphics, video and animation markets.

RC Electronics Canada.

90 Nelson Street, Unit 4A, Markham, Ontario L3R 4J9
Tel (905) 413-0300 Fax (905) 413-0320

RC Electronics operates in the design and sales of integrated circuit and analog IC's, discrete, and diode arrays, RLC electronic component packages while providing the highest quality standards and quick turnaround. Advanced exchanges, technical support and a minimum of six month warranty are just a few advantages you receive.

Ready Computer International

8170 - 12880 Clarke Place, Richmond, B.C. V6V 5N1
Tel (604) 274-3344 Fax (604) 274-3348

A national distributor of high quality 4-GB RAM modules. Also carries SIMMs, ribbon cable, memory boards, CD-ROM drives and read media CD titles.

Samsung Electronics Canada Inc.

3000 Yonge Street, Mississauga, Ont. L3V 1A1
Tel (905) 667-9113 Fax (905) 667-9111

A manufacturer of PC systems and peripherals including notebooks and workstations, PCs, printers (dots and dot-matrix), monitors, hard disk drives and fax machines.

Savantech Computer, Inc.

3000 Yonge Street, Mississauga, Ont. L3V 1J2
Tel (905) 667-9113 Fax (905) 667-9113

Savantech carries name brand motherboards, ram modules, video cards, CPU's, memory power supplies, CMOS, drives, keyboards, mousepads, CD-ROMs, speakers and printers. The company distributes components, CD-ROM titles, and complete turnkey PCs.

Scans II Interactive Distributors

130 Wager Road, Suite 100, Woodbridge, Ont. L4L 4J7
Tel (905) 667-3416 Fax (905) 667-3449

Scans II is the exclusive distributor for many international brands for adults, serving the Canadian market.

Scipex Technologies Inc.

46800 E. 46th Street, City of Industry, CA 91747
Tel (714) 339-3300 Fax (714) 339-5449

Scipex Technologies manufactures high resolution color print engines, PC controllers and related products. Highlights are a 17 inch color monitor in resolution with 1280x1024 resolution at 75Hz. This will be followed soon, the monochrome version, the Scipex Scans II Series 2000, a new generation of light-weight, space-saving LED monitors with a 13.3inch TFT color screen and a PC-like integrated color monitor. Scan II monitors are backed up with the company's service. Scipex will continue to enhance features in presentation, frame and entertainment. A wide-angle color camera is also offered.

SDC Canada Inc.

178 Bloor St. West, 208 First Floor, Toronto, Ont. M5S 1N7
Tel (416) 933-1937 Fax (416) 933-1937

A provider of UNIX operating systems for the Internet or elsewhere

SOMS Ltd.

81 3531 Jarvis Street, Richmond, B.C. V6V 1Z8
Tel (604) 270-0307 Fax (604) 270-0316

SOMS is a Forest City hardware manufacturer and distributor. Products manufactured are cash registers, supermarket magnetic stripe readers and custom hardware designs. SOMS also distributes a full line of POS peripherals including Epson, Star and CIM printers. Also available products include 9" Monitors, Barcode readers, cashbox displays etc. Somesales all across Canada. Also provides sales and technical support.

Branch Office:

Mississauga, Ont. Tel (905) 564-4997 Fax (905) 564-4998

Montreal, Que. Tel (514) 383-9898 Fax (514) 383-9891

Scansa Technology Inc.

9440-6075 Edmundo Way, Richmond, B.C. V6C 4N1
Tel (604) 213-0492 Fax (604) 213-0492

A PC manufacturer based in Richmond, B.C., with facilities in Calgary, Edmonton, Toronto and Montreal. With its own engineering department and an extensive assembly line in its B.C. facilities, Scanix is the manufacturer of IBM compatibles and also offers PCs, hard drive assemblies and other peripherals as an OEM house.

Scansoft

Guelph, Ont. Tel: (519) 824-5142 Fax: (519) 829-3916
Gatineau, Que. Tel: (800) 660-0229 Fax: (800) 660-0223

ServiceWorks Inc.

1000 Mayfield Rd., Burnaby, B.C. V5J 2B9
Tel: (604) 533-6253 Fax: (604) 536-3156

ServiceWorks supplies Barco, DataGrate, and Pioneer products.

Shang Electronics of Canada

301 Bremner Rd., Mississauga, Ont. L2J 2P9
Tel: (800) 232-3000 Fax: (905) 667-7197

A manufacturer of LCD panels and projectors based products, color scanners, and keyboard enhanced personal digital assistants (KPDAs).

Sikharionics Inc.

Ste 204, 10700 Keelewood Blvd., West, Etobicoke, Quebec, P.O. H4T 1E7
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A leading distributor and manufacturer of memory products. Available third party memory!

Siklu Systems Inc.

4610 Leslie Street, Richmond Hill, Ontario, Ont. L4B 1J7
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Web site: <http://www.siklu.com>

A manufacturer and distributor of linear workstations and IBM-compatible PC systems and integrated printing/scanning/processing solutions for single-unit or multi-headed environmental test and AT/ATII alliance partner providing a complete line of SEATEC dual-axis offer.

Toronto, Tel: (800) 322-2311 Fax: (905) 332-3232
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Winnipeg: Tel: (204) 221-0900 Fax: (204) 209-0327
Ottawa: Tel: (613) 749-7777 Fax: (613) 749-3458
Montreal: Tel: (514) 331-3658 Fax: (514) 338-3089
Vancouver: Tel: (604) 923-8100 Fax: (604) 429-2162

Simple Technology Inc.

9050 Lakeshore Road, Guelph, Ont. N1G 1R9
Tel: (800) 738-7123 Fax: (519) 823-7330

Tel/Fax: (519) 823-7330

A Canadian-owned value-added distributor of computer products and peripherals.

Skycray Computer Centre Inc.

43 Boundary St., Markham, Ont. L3R 2M2
Tel: (905) 439-8500 Fax: (905) 439-8639

Lever distributor among Canada nationwide. Specializing in computers and systems of very high quality.

ScanLab Pro-Sonic Electronic Supplies Inc.

1333 Fraser St., Vancouver, B.C. V6E 2D7
Tel: (604) 685-0400 Fax: (604) 685-0449

Pro-Sonic supplies electronic status products and is manufacturing a new broad range SMC as the result of an extensive product line. Products include a full range of ruggedized computer systems, servers, computer mini-computers and controllers of various designs and a range of computer peripheral accessories.

Sole Canada

1008 Lakeshore Blvd., Unit 9, Mississauga, Ont. L4W 1H3
Tel: (800) 236-0253 Fax: (905) 261-0253

A distributor of power products for the electrical and electronic industry. Includes regulators, rectifiers, modules and full-line power-supply power systems.

Sony of Canada Ltd.

Computer and Personal Information Products

405 Gordon Baker Rd., Mississauga, Ont. L5J 2M7

Sony's mainline products include the CD-ROM Discman, quad-speed CD-ROM drives and audio prod-

ucts.

SPBC Research Inc.

10210 Bedford Creek, City of Mississauga, Ont. L5L 1A9
Tel: (905) 454-0255 Fax: (905) 454-5807

SPBC Research Inc., a value-added reseller of legacy devices in the computer market. As a keyboard specialist, they are the largest importer and distributor for the most popular keyboards.

Branch offices:

North West Tel: (705) 496-8130 Fax: (705) 499-8379

StarTech Computer Products

1065 Peachtree St. NE, Suite 200, Atlanta, Georgia 303 185

Tel: (404) 489-0529 Fax: (404) 489-0325

Alt: (770) 459-1298

E-mail: stech@compuserve.com

StarTech Computer Products is a manufacturer/supplier to serving Canadian customers. The company specializes in LAN Adapters, Network Print Servers, Peripheral Sharing Switches and all types of computer cables.

STD Systems Inc.

4825 Eglinton Court, London, Ont. N6C 2M7

Tel: (519) 458-0301 Fax: (519) 458-2199

Web site: <http://www.std.com>

A computer hardware manufacturer and worldwide distributor of computer accessories, the Brother line of printers, LED and SOHO motherboards, Xamax Monitors, Growth and Fluorescent notebooks and board peripherals. Manufacturers of its own name brand machine. Computer Motherboard supplier offer supplier.

Branch offices:

Edmonton, AB Tel: (403) 466-0900 Fax: (403) 463-1255

Kitchener, ON Tel: (519) 273-0897 Fax: (519) 753-3861

Mississauga, ON Tel: (905) 669-2221 Fax: (905) 669-3003

Toronto, Ont. Tel: (416) 477-0384 Fax: (416) 473-0127

Guelph, Ont. Tel: (519) 826-1557 Fax: (519) 826-0551

Montreal, Que. Tel: (514) 336-0500 Fax: (514) 334-1827

Ottawa, Ont. Tel: (613) 738-2522 Fax: (613) 736-2287

Stealth Computer Corp.

1788 Allen Rd., Toronto, Ont. M9P 1J2

Tel: (416) 424-0800 Fax: (416) 419-3229

A manufacturer and distributor of advanced computer products including midrange PCs, industrial desktop PCs and rugged portable PCs.

Sun Microsystems of Canada Inc.

100 Argyle St., Mississauga, Ont. L5J 2B6

Tel: (905) 473-2401 Fax: (905) 473-9423

A supplier of distributed computing technologies, products and services. Its open client/server computing solutions include networked desktops and servers, operating system software, enterprise management solutions, web design, and other value-added technologies.

Summit Image Ltd.

4935 Action Avenue, Burnaby, B.C. V5J 1E5

Tel: (604) 527-7341 Fax: (604) 477-3308

Manufacturer and supplier of 3.5" and 5.25" cache floppy disks, including both high capacity diskettes and low

capacity drives. Duplication services are also provided.

Superspec

517 Dundas St., Mississauga, Ont. L4Y 1K9

Tel: (905) 421-2199 Fax: (905) 415-2177

Supplier of computer hardware products to the smaller market across Canada. From offices and warehouse in Vancouver and Toronto, it distributes a wide selection of broadband products from computer systems to prepreg cable and components.

Branch offices:

Vancouver, B.C. Tel: (604) 226-2027 Fax: (604) 226-6807

Symantec Canada

200 10th Embassy Dr., #900, Mississauga, Ont. L5J 2J2

Tel: (905) 669-0217 Fax: (905) 669-0202

Symantec has applications and security software products designed to enhance individual and workplace productivity as well as manage networked computing resources.

Tech Data Canada Inc.

1609 Bloor Street W., Mississauga, Ont. L3T 1J9

Tel: (905) 626-0800 Fax: (905) 295-2595 Tel: (905) 626-0800

Tech Data is a leading value-added distributor of networking, storage, software, server, CPUs and peripherals. Tech Data also provides KVMs with an array of features such as video servers including technical support and Novell and Microsoft training.

Branch offices:

Vancouver, B.C. Tel: (604) 514-0968

Tektronix Canada Inc.

247-Armstrong Road, Mississauga, Ont. L5J 2A4

Tel: (905) 247-5000 Fax: (905) 247-5099

Branch offices:

A manufacturer of electronic measurement equipment, video systems (monitoring) and color printing and imaging devices.

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Tel: (416) 259-7030 Fax: (416) 259-6946
A 100 per cent Canadian owned national distributor focused on data storage solutions, disk, tape, optical and CD-ROM.

Texas Instruments Canada Ltd.

Personal Performance Products
41 Valley Rd., Richmond, Ont. L8C 3M2
Tel: (905) 684-8162 Fax: (905) 684-8168
A manufacturer of laptop notebooks, laptop graphics cards, precision cameras and organizers.

TKIP Electronic (Canada) Ltd.

8110 17022 Concorde Road, Richmond, B.C. V6V 5B2
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A national distributor of SCSI designed tape drives, SCSI drives, high quality spinners and multi-format products. 1995 model 1.4GB series easy to profitable now. They also carry level drives, MMMS media cards, ED-RIM drives and CD-tapes.

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A distributor of top quality value/multimedia computer, computer specialty, memory keyboards, case parts and other peripherals.

Toohills of Canada Ltd.

300 McAdam St., Abbotsford, B.C. V2S 8J2
Tel: (604) 429-3149 Fax: (604) 426-3439
Sales office: 1-800-649-8729
A provider of mobile computer systems for business professionals. Also sells and supports a range of notebook computers from three V-line series to their Perseus range notebooks and advanced portable business laptops.
Sales office:
Richmond Tel: (604) 279-2588 Fax: (604) 279-0337
Calgary Tel: (403) 229-3887 Fax: (403) 229-1924
Vancouver Tel: (604) 531-6541 Fax: (604) 534-6753
Ottawa Tel: (613) 723-2500 Fax: (613) 723-3759
Victoria Tel: (604) 559-7131 Fax: (604) 559-7127
Quebec City Tel: (418) 626-2882 Fax: (418) 626-5544

Trinex Marketing Inc.

4071 Yonge St. Apt. 620, Richmond, B.C. V6V 3K9
Tel: (604) 279-0700 Fax: (604) 279-0619
TMI is a wholesale distributor of computer accessories, peripherals and supplies. TMI serves all of Canada with over 100 offices in Ontario and Richmond.
Sales office:
Markham Tel: (905) 470-0311 Fax: (905) 474-1972

Trugor Technologies Inc.

795 Bayswater Court, Mississauga, Ont. L5N 2P4
Tel: (905) 649-9544 Fax: (905) 642-9229
A national distributor of Unisys midrange systems, prod. new servers and networking. Provides the reseller with comprehensive support in products through personalized, personalized service and professional services.
Sales office:
Mississauga Tel: (905) 599-1489 Fax: (905) 598-1242
Vancouver Tel: (604) 452-8649 Fax: (604) 682-2425

TTX Canada Inc.

14-2200 Arundel Drive, Mississauga, Ont. L5R 2Z7
Tel: (905) 231-5000 Fax: (905) 230-5408

TTX is a leading broad dealer for memory in Canada with over 12 years experience. TTX offers a full range of memory from monolithic VGA to 21" on a value oriented and performance quality series. All TTX memory units are also available as integrated Thread Servers. A two year memory warranty is offered by our own experts staff. Branch offices:

Vancouver Tel: (604) 279-2721 Fax: (604) 279-1799
Edmonton Tel: (403) 256-6827 Fax: (403) 244-1992
Winnipeg Tel: (204) 633-7187 Fax: (204) 633-7187

TV/M Video & Monitor Canada Inc.

1700 Bayswater Road, Richmond, B.C. V6V 2P2
Tel: (604) 278-0286 Fax: (604) 279-2669

TV/M is a Tandy-based reseller manufacturer producing memory units from 16 to 32 MB per card resolution ranging from 128x160 to 1400x1280.

Upfront Computer Corp.

100 Union St., Suite 1000, Seattle, Wash., U.S.A. 98101
Tel: (206) 467-2000 Fax: (206) 467-1449

Upfront is a Canadian distributor. They offer the latest Pentium & MMX™ microprocessors including Intel's Celeron. They also supply a full line of Macintosh Systems, monitors, peripherals such as mouseboards, video cards, memory and SCSI's.

UNIFELL Microsystems Inc.

4111 10th Street East, Richmond, B.C. V6V 1J8

Tel: (604) 256-1646 Fax: (604) 256-0981
A national distributor of computer system boards, motherboards, add-on cards, hard drives etc.

Urtek Distribk

127 Union St., Abbotsford, B.C. V2S 1A7
Tel: (604) 853-4343 Fax: (604) 853-5849

A national distributor and providing singleourcing for mobile PLCD® products.

ViewSonic Canada

100 Commerce Road, Mississauga, Ont. L5J 3M6
Tel: (905) 629-1000 Fax: (905) 629-6134

ViewSonic distributor high-resolution color monitors for personal, CAD, and multimedia. Also featured is the Opti-UPS™.

V-Tools Computer Systems Inc.

4070 Bayswater Road, Unit 1, Mississauga, Ont. L5N 2P3
Tel: (905) 279-2240 Fax: (905) 279-2218

V-Tools Computer Systems is a Canadian-based supplier of PC manufacturers and distributor. The company is the exclusive distributor of V-Tools Laser and Enclosed tape drives.

Sales office:
Richmond Tel: (604) 259-0788 Fax: (604) 279-2649
Edmonton Tel: (403) 673-1527 Fax: (403) 612-5229
Vancouver Tel: (604) 261-2255 Fax: (604) 269-2879
Montreal Tel: (514) 333-2556 Fax: (514) 333-1402
Quebec City Tel: (416) 681-0840 Fax: (416) 681-0729
Montreal Tel: (514) 333-0840 Fax: (514) 333-1222

WAVEPOINT Technologies Inc.

104-104, 1700 Bayswater Rd., Mississauga, Ont. L5R 2P2
Tel: (905) 279-2240 Fax: (905) 279-2218

WAVEPOINT is a distributor of wave point solutions and software and developer of wave point applications. Wave point is a family of high speed data capture and analysis tools for image and speech data. Wave point and CD-R replication equipment, wave and word clock distribution and prolonging equipment, labelled, trigger voltages and digiwave.

Web-Micro Electronics Inc.

1300 Concourse Road, Suite 173, Richmond, B.C. V6V 2E4
Tel: (604) 279-1868 Fax: (604) 279-0282

Web-Micro's product line includes monolithic motherboards, hard drives, memory chips, logic modules, interface cards and multimedia products.

Branch office:

Richmond, B.C. Tel: (604) 866-0300 Fax: (604) 866-2890

Westcom Canada Systems Inc.

1000 Concourse Rd., Mississauga, Ont. L5R 2H2

Tel: (905) 279-3111 Fax: (905) 294-6873

A manufacturer of network cards, intelligent hub and router solutions, and corporate learning centre.

Western Digital Canada Corp.

1000 Concourse Rd., Mississauga, Ont. L5R 2H2
Tel: (905) 279-0200 Fax: (905) 279-0211

A designer and manufacturer of hard drives, integrated circuits, and graphics controller based-level products.

White Knight Distributing

105-1500 Keele St., Richmond, B.C. V6V 1P2
Tel: (604) 275-5966 Fax: (604) 275-0982

Address: 1-800-667-4310

A distributor of IBM-compatible personal computer systems, peripheral cases, keyboard, memory, graphics cards, value cards, monitors, keyboards, printers and multimedia products. Sales dealers throughout Canada. Also provides sales and technical support. Branch office:
Richmond, B.C. Tel: (604) 586-382-242 Fax: (604) 586-3890
208-1208 10th Street, Richmond, B.C. V6V 1A9
Calgary, AB Tel: (403) 269-2300 Fax: (403) 269-2301 Tel: (403) 665-3733

Xerox Canada Ltd.

500 University Street, Mississauga, Ont. L5J 1P2
Tel: (905) 279-3669

Xerox is a leading digital document management products and services. Work Centre products support customer as stand-alone or networked black and white printing/color printers, scanners, document scanners and copiers.

Yklan Canada

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Tel: (905) 567-2600 Fax: (905) 567-2624

A national computer distributor.

Zenith Data Systems Canada Ltd.

4075 Bayswater Road, Mississauga, Ont. L5N 2P3
Tel: (905) 279-0217 Fax: (905) 279-3172

A full-line company and a supplier of notebook computers and desktop PCs, servers, monitors and related peripherals.

Zentronics

3600 Avenue Laval, Mississauga, Ont. L5R 3P3
Tel: (905) 662-1100 Fax: (905) 661-1123

A manufacturer of high-speed LAN switches.

ZyXEL

4000 E. 7th Place, Mississauga, Ont. L5R 2L2
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by Alex Zissman

Even though they're not getting the hot media attention, CD-ROM players have been rapidly evolving over the past year—with a sense that even bigger changes are on the horizon. Some of the areas to watch:

What's new on CD-ROM players

quickly replaced by the next generation. Now, quad-speed is the current standard, with some manufacturers pushing it a bit, offering 4.4 speed for a modest performance boost.

newer games, in particular, or other software including video clips will be optimized for quad-speed, letting users of quad and faster drives see improved performance (while users with slower drives will suffer from dropped frames).

Four, four, four CDs in One

— review of NEC's MultiSpin 4x4

What can you do with last year's buzz-word?

A year or two ago, the buzz-word was 'multimedia'. Upgrade your computer, add CD-ROM and sound. And it worked—a whole industry devoted to multimedia upgrades of existing machines sprung up. But it's almost become a victim of its own success—over half of the computers sold for the home market now include multimedia features, with some predicting that by the end of 1996, this will be true of virtually all home computers.

Instead, this year's buzz-word, 'Internet' receives the bulk of the media type (at least whatever won't distract at Windows 95)—and multimedia gets taken for granted.

So if you're a respected producer of CD-ROMs, such as NEC, what can you bring to market? You can take machines that are fast—single speed drives were replaced by double-speed, and after a few triple-speed models appeared, quad-speed drives have become the new industry standard. Some companies are marketing six- and eight-speed drives.

But multiplying the speed of the drive doesn't really produce the benefits that you might think—while games optimized for quad-speed drives are now beginning to appear, most software is still optimized for double speed drives, and running that software on a faster drive, users will see at best, a more modest increase in performance than they expect.

(Continued on page 86)

HARDWARE REVIEWS

speed

readability

attachment

multi-platters

capacity

Speed Single-speed drives have totally vanished from the shelves, and double-speed drives have disappeared from all but the markdown sell-out counters. A few triple-speed models appeared, but were

Six-speed and even eight-speed models have started to appear, but with current software still mostly optimized for double-speed, users don't get the full performance benefit. By the end of this year, most

Attachment Initially, users had a choice between SCSI and proprietary cards. SCSI was standard, and offered better performance, but cost more, and often involved cumbersome set-up for PC users.

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What's new on CD-ROM players

speed

readability

attached

multi-platters

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(It's standard on Macs). Low-cost units such as the widely-distributed Panasonics and Minisums came with their own cards, that only worked with their single model. Many users attached their CD-ROMs to their sound cards, but again had problems... unless they bought them together as a multimedia upgrade kit, it was easy to get units that wouldn't plug together.

Instead, a third alternative has arisen—sometimes referred to as ATAPI, it plugs the CD-ROM into the standard AT-bus using an enhanced IDE (EIDE) card—just like most PC hard drives. This is a low-cost alternative to SCSI, which while not

Multi-platters At first, the 650 mega bytes of a typical CD-ROM disc seemed like an almost-infinite amount of storage. Perhaps not surprisingly, games and other multimedia products have quickly found a way to need more. Microsoft's children's encyclopedia, Explorapedia, for example, at first planned for a single disc, ended up as a four-disc set. Games started replacing animated sequences with more and more filmed video—and expanded to two, four, and even seven disc sets. Sort of like playing off multiple floppies in the late '80s.

Audio CD fans have been able to buy affordable multi-disc players for

Capacity If 650 mega is just too little, what about new formats? Conventional CDs are produced and read using red lasers... newer technologies using blue lasers have become available. Because blue light has a higher frequency (and shorter wave length) than red light, blue lasers can pack more information onto the same sized disc. Finally, a mutually agreeable standard has been set amongst the various factions in the computer, audio, and video industries... the new format is variously known as DVD, when used for audio and video, and SD-ROM for discs with predominantly computer data. SD-

(Continued from page 50)

For many computer users, however, CD discs are becoming the floppies of the nineties. A decade ago, users welcomed reasonably priced hard drives (everything is relative—my first hard drive was a \$400 40-megabyte I bought in 1988), to eliminate constant floppy swapping. Now, with many popular games requiring multiple CD discs, users are starting to feel limited by the mere 650 mega bytes available on each disc.

Sometime in the future, today's CDs will be replaced by tomorrow's standard—the multi-gigabyte DVD disc (also known as SD-ROM), holding music, video, and CD-ROM data. Of course, you'll need all new hardware to run that (depending on how far hardware vendors' eyes). But that's not yet—maybe 1997.

Instead, computer users have cast an envious eye at home stereo systems—multi-disc audio CD cartridges are increasingly common and affordable. But CD-ROM requires more power and robust mechanisms to handle random access of data and multi-CD-ROM machines have been slow and pricy, with a small market appealing mainly, it would seem, to BBS operators, wanting to provide multi-jigs of files for dial-up access.

NEC's MultiSpin disc is aiming to change all that. It's a standard-sized internal CD-ROM unit that's affordable and easy to add to your current computer—while working at a four-speed, four-disc changer.

Like some car CD-units, it stacks your discs in, storing them internally—while older units, there are no caddies or cartridges.

(Continued on page 62)

HARDWARE REVIEWS

providing as high performance as SCSI (especially in multitasking environments) will be acceptable for most stand-alone systems. Network servers should probably stick to the more industrial-strength SCSI. One thing to watch out for—users can connect their hard drive and CD-ROM to a single EIDE card, but Windows for Workgroups will shut off performance-enhancing 32-bit File Access for the harddrive. The answer is a separate card and cable for each device.

years now, and three-disc video CD players are popular in Asia, but this solution has only started to catch on in the CD-ROM market. Now, suddenly, a number of models are available, loading between four and seven discs. Some require the discs to be pre-loaded into a cartridge, while some of the newer units, like the NEC MultiSpin four and seven disc units, or the comparable Nakamichi models allow users more spontaneity.

ROM discs will store multi-gigabytes of data, using blue-laser light and steering data in several layers on both sides of a standard-sized disc.

This standard will allow a feature length movie to be stored on a single disc, or to allow more flexibility mixing video, audio, and computer data all on the same disc. Of course, you'll need new hardware to make use of these enhancements—at least new players, both for your computer and your home audio/video setup...

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What's new on CD-ROM players

these may start being available as early as this Fall, and will be able to read the current generation of audio and data CDs.

to consider mastering their own CDs. Hard drive prices have dropped, but CD-R remains too pricey an option for most users (I'd love to be able to

disc drives? Multi-disc drives? CD-R? SD-ROM? I suspect that in the next six months to a year, many consumers will end up confused, and

(Continued from page 60)

to load. An internal elevator switches between discs. The result is a sleek package that fits neatly into the space taken by a standard single-disc player. Four buttons and LEDs on the front let the user select which disc will be accessed.

Unlike other NEC models, which used SCSI, the 4x4 uses the more common and affordable EIDE interface—a card and cable are included. It can be set up in your choice of two modes: Single-drive letter mode lets you treat all five discs as a single drive, often drive D. In Multiple-drive mode, each disc gets a separate drive letter—perhaps D, E, F, and G. Each mode has its advantages—the single-drive letter could make it easier to switch between discs in a multi-disc game, or to work with discs that have been installed with using an older, single-disc unit.

The multiple-drive mode could be nice if you always want to keep a reference disc, say an encyclopedia or Microsoft Bookshelf in one of the discs—it could always be accessed on drive G regardless of what was being used in the other drives. If you're a Win95 user, you get no choice—those drives only support multi-drive mode, though NEC promises that future upgrades will offer the same features that DOS/Win 3.1 users already have.

Hardware and software roundups are about as expected for any upgrade that requires opening the case. It went smoothly; NEC



packs a poster detailing the installation process, and even includes an instruction videotape to help novices. Note that if you already have an IDE hard drive, you can install this drive on the same card, but you'll probably get better performance running it off its own adapter (which is included).

Once it's up and running, you'll find it in the middle of the pack of quad-speed CDs—no speed demon, but no slouch, either. Switching between discs is a smooth process, taking a couple of seconds to eject a disc, or four or five seconds to access a disc after loading.

With single-disc quad-speed drives hovering around \$399 at the stores, you may ask yourself whether this unit's \$399 price is worthwhile. It is double the price of a single-disc unit—but offers the capabilities of four single units. If you want multi-disc capabilities in a small, normal unit, you may find this well-packaged product good value. BBS operates with a large tower system could consider buying three or four of these, for quick and easy access to 12-16 discs at a time. NEC is also marketing a seven-disc external model.

Alternatively, Canadian distributor GMS DataLink is marketing the Nakamura MU-44, featuring virtually identical hardware, for a similar estimated retail price of \$399.

HARDWARE REVIEWS

speed

recordability

attachment

multi-platters

capacity

Recordability Even though consumer-level videotape offers a much lower picture quality than laserscapes, it is much more popular. Why? Users like being able to tape off their TV, and are willing to live with lower quality to have that flexibility.

CD-R (for recordable) has been available for a few years, but units have been too high-priced for wide acceptance. As well, users need a large, fast hard drive, with lots of free space, before even being able

use it for archiving and backing up hard drives). Other manufacturers are offering more exotic solutions: Panasonic's LF-1000AB PowerDrive-Z, for example, offers a combination standard read-only CD-ROM with a writeable optical drive, et under the magic \$1000 price point, but the optical cartridges are expensive, and can't be read on standard CD-ROM drives.

Putting it all together—several of these trends seem to be going off in different directions. Faster single-

postponing purchases, at least for the higher-end units.

For those potential consumers, a low-priced quad-speed model may be fine for now, while it may be a good time to put off a large investment in a technology that may change dramatically over the next year or so. Distributors may want to watch technology trends carefully, and avoid carrying too much inventory in this potentially unstable market.

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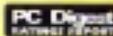
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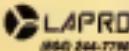
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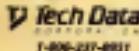


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